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Methodological Problems in Cross-Country Analyses of Economic Growth

Jean-Paul Azam
and
Sylviane Guillaumont

Cross-country studies provide a weak basis for the formulation of economic policies in developing countries.

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Many cross-country studies have been conducted over the last 20 years to explain how various factors affect economic growth rates in the developing economies. The data in these studies — which underlie international economic comparisons and serve as the basis for economic policy recommendations — give researchers the systematic and scientific information required for their investigations. But the conclusions are often fragile and sometimes contradictory.

Research results are sensitive to the choices of components, the aim of the investigation, and the type of model used. In general, researchers need to have better statistical data, particularly on economic policy indicators, and must subject the selected sample to careful tests.

Cross-country studies are particularly unreliable when it comes to estimating the economic impact of government budgetary and regulatory policies. These studies thus provide only a weak basis for developing country economic policies.

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Cross-sectional Analysis of Factors Affecting Growth in Developing Countries: Examination of Methodological Problems

A large number of studies of international cross-sectional data have been conducted during the last 20 years in an attempt to explain the growth rate or other variables in the developing economies. The purpose of these studies is to permit scientific comparison of national experiences, as the basis for policy recommendations. In the absence of systematic and scientific international comparisons, judgments are likely to be based only on partial comparisons and subjective evaluations. Moreover, if international cross-sectional studies are to serve for economic policy, their conclusions must be solidly established. Yet it seems that, in the present state of the literature, these conclusions are relatively fragile and sometimes contradictory.

The conclusions depend on the methodological choices made. What definition is used for economic growth? Is it measured over a long or a short period? Does the investigation concern all countries or a homogeneous subset? Does it seek to evaluate all factors affecting growth or, on the contrary, to bring out the impact of some particular factor? Is the aim to measure the overall impact of one or another factor or to identify the mechanisms through which it affects growth? Is this done using a reduced form model or a structural model?

The purpose of the present work is obviously not to resolve all the methodology problems posed by cross-sectional studies. Nor is it to present an exhaustive balance sheet of the cross-sectional analyses that contribute to knowledge of factors affecting growth and of the efficacy of economic policies.

Our analysis is based on some 30 cross-sectional studies selected using various criteria. The reference studies used here are recent studies (since 1982), written in English or French, that directly explain growth (excluded are studies designed solely to explain certain factors affecting growth, such as the saving rate, the investment rate, the rate of export growth, etc.). The reference studies, moreover, either use a large range of independent variables or display originality in the choice of factors affecting growth or in the way they have analyzed them (cf. table 1).

The methodological questions posed by cross-sectional analysis have been grouped into two categories. The first series of questions concern the choice of the dependent variable (i.e. the growth indicator adopted), the countries and the period over which it is measured, that is, the characteristics of the sample. The second series of questions concern the independent variables, i.e. their selection, their

measurement and the way in which they have been introduced into the explanatory model, that is, the characteristics of the model.

1. Choices Concerning the Dependent Variable: Characteristics of the Sample

The literature is characterized by a wide variety of choices with respect to the aggregate whose growth is studied, the set of countries and the period for which the estimate is made. The justification for these choices is not always clearly stated. Yet they can affect the econometric results and the conclusions of the analysis. Some aspects of this sensitivity will be illustrated with the help of a simple model applied to different measures of the dependent variable.

This model, without any claim to originality, adopts five independent variables from among those currently used in the literature. Three of them reflect economic policies (inflation rate, public expenditure share of GDP, and rate of growth of goods and services exports weighted by the share of these in GDP). The other two (initial GDP per capita and population) correspond to fundamental economic data that are independent of the economic policy followed during the period. We therefore estimated as follows:

$$\frac{\dot{Y}}{Y} = a + b \log \frac{Y}{N} + c \log N + g \frac{G}{Y} + h \frac{\dot{P}}{P} + j \frac{\dot{X}}{Y} + u$$

in which the dot over the variable represents the time-derived variable, N = population, P = general price level, G = public expenditure, X = goods and services exports, and u = a random disturbance. Y represents product, defined differently depending on the case.

1.1 Choice of aggregate used to measure growth

1.1.1 Domestic or national

Most of the studies use GDP. A few, however, prefer GNP (Balassa 1986, Devarajan and de Melo 1987, Kavoussi 1984, Moran 1983, Ram 1985, Venieris and Gupta 1983). One study uses both aggregates together (Kormendi and Meguire 1985). (Cf. table 1, column 2).

The choice of one or the other aggregate is justified by the purpose of the study. If the purpose is to study the growth of economic activity, GDP is appropriate; if, on the contrary, it is rather to ascertain what affects the trend in living standards, GNP seems appropriate. In the latter case, moreover, the choice of another aggregate may be justified (e.g. national expenditure, or perhaps national product, corrected for evolution of the terms of trade, etc.).

The difference between GDP and GNP consists of net factor income payments. Consequently, the greater the change in share of factor income payments in the product, the greater the difference in growth rate of the two aggregates for a given country. It is probable that in the late 1970s and early 1980s the gap was appreciable and varied with the evolution of interest payments (and of income remittances of migrant workers who had remained residents of their country of origin).

Table 2 compares average annual growth rates of GDP and GNP calculated on the basis of the World Bank's World Tables. The absolute gap between the two rates exceeds 0.5% in only 9 cases out of 85 during the period 1970-81, and 15 cases out of 86 in 1974-81; it exceeds 1% in only 3 cases and 5 cases, respectively, over these two periods. The difference is therefore less important than might have been supposed. This result is perhaps due to poor estimation of the trend of factor income payments.

The illustrative model was estimated using the two definitions of product (cf. results, table 3, equations 1 and 2). The model explaining GDP growth is seen to be a little better than the model explaining GNP growth. This may result from the greater risk of error in GNP estimates due to poor knowledge of international factor income payments or to the fact that the independent variables are less well adapted to explanation of GNP growth than of GDP growth.

1.1.2 Data sources

Most of the studies use World Bank data to measure product. However, a few use IMF data (Fry and Lilien 1986, Kormendi and Meguire 1985, Landau 1986, Lanyi and Saracoglu 1983, Rana 1987) and others, United Nations data (Venieris and Gupta 1983). Some authors have also used the data of the project of international comparison of products on the basis of purchasing power parities (Landau 1983, based on Kravis 1979, and Ram 1986, based on Summers and Heston 1984). Finally, some studies do not specify the data source (cf. table 1, column 2).

The choice of source is not without importance for the measurement of growth, as is evident in various studies. This is shown by Ahmad and Kwon (1981) for the difference between IMF and World bank data, and Plane (1986) for the difference between World Bank and UNCTAD data. We have tried to assess the magnitude of the difference between the two rates calculated using World Bank and IMF statistics for GDP at market prices over the period 1970-81 (see table 2). The differences between these two rates are found to be greater and more frequent than the differences previously observed between GDP and GNP growth rates: over the period 1970-81 the absolute gap exceeds 0.5% in 14 cases out of 55 and 1% in 9 cases; over the period 1974-81 it exceeds 0.5% in 18 cases out of 37 and 1% in 11 cases; in some countries (Honduras, Malaysia), it is substantial.

The difference between World Bank and other statistics seems to result chiefly from the fact that adjustments are effected at the World Bank. Some of these adjustments are intended to correct for the fact that the method of preparing the accounts does not always conform to the United Nations standard system or for inconsistencies in the accounts. Other, more delicate, adjustments take account of country economists' opinions concerning the reliability of the official data. Subject to the quality of these adjustments and uniformity of the principles underlying them, it seems preferable to work with the World Bank statistics. The advantage of the other series is that they are available more rapidly and more regularly.

As the illustrative model shows (cf. table 3, equations 3 and 4), the coefficient of determination is in fact a little better using the World Bank data.

The use, still rare, of the statistics of the international comparison project, perfectly justified for comparing standard of living levels and trends, is much less justified for measuring economic efficiency through growth of product. This efficiency cannot be judged in each country without taking into account the structure of costs and scarcities, which is reflected in the country's price system.

1.1.3 The choice of the base year

The growth rates are calculated on GDP series measured at constant prices. The base year in which these series were originally established naturally varies from country to country. The series of aggregates published by the international agencies, including the World Bank, have used a base year varying with the country, which nevertheless, as we have seen, ensured a certain harmonization of the statistics. The next edition of the World Tables will present aggregates on a uniform base year for all countries, the year 1980. These data could not be used up till now and all the cross-sectional analyses of growth studied here use series established on base years varying from country to country. This practice raises a problem that has been ignored by all of the studies examined.

For example, the price system that can be used to aggregate the various branches of activity differs greatly, depending on whether we are dealing with the pre- or post-oil shock period. In an oil-producing country, the weight given to growth of the mining sector differs widely according to whether the base is prior to or subsequent to the oil shock. If the growth of the mining sector differs from that of the rest of the economy, this results in a difference of evaluation of overall growth, depending on the base adopted. 1/ The problem arises when a country's growth is relatively highly concentrated in a sector whose production is subject to wide variations in relative prices and grows at a different rate from the rest of the economy. This was true of the mineral producing countries, particularly those that were new producers or, on the contrary, declining producers during the period.

In order to assess the practical importance of the choice of base year, we proceeded to carry out 12 partial rebasings, recalculating GDP series at constant prices on the basis of value added series at constant prices, broken down into 12 sectors, derived from the World Tables 1984. For that purpose we established a deflator for each sector, the prices of each year serving in turn for calculation of a global product series whose base was the corresponding year. 2/

In this way we were able to calculate for the period 1970-81 and for 73 countries, by regression, average annual growth rates on the basis of each of the years (i.e. 12 average growth rates per country). In more than half the cases (39 countries) the gap between the maximum and minimum rates exceeds 0.5%. For 22 countries it exceeds 1%. In some cases, most of them oil-exporting countries, it is substantial (Nigeria 7.2%, Iran 4.2%, Congo 2.9%, etc.).

The illustrative model was estimated using the growth rates calculated for various base years for a sample of 40 countries. It was found first of all that the coefficient of determination varies between 0.54 and 0.62, the best estimates according to this criterion being obtained, curiously, by using as bases the years following the two oil shocks (1975, 1976, 1980, 1981). We next note that the value of the coefficients estimated hardly changes with the base year (with the exception of the constant) but that the "Student's" value for t changes appreciably. For example, the share of public expenditure in GDP, which is practically never significant, becomes so (at the 10% threshold) in base 1980. Thus, if the choice of the base year does not seem to entail any bias in estimating the coefficients, it can skew the selection of independent variables.

In brief, it is found that growth measurements differ substantially, depending on the base year adopted and the source used and, to a lesser degree, on the nature of the aggregate adopted. But, in conformity with the econometric theory of measurement errors (for example, Stewart and Wallis, 1981), the differences in the measurement of the dependent variable have little effect on the results of the econometric estimates of the factors affecting growth.

1.2 Choice of countries and periods

The cross-sectional analyses of economic growth are based on a wide variety of country sets and a wide variety of periods (cf. table 1, columns 2 and 3). The choices made result logically from the nature of the question posed; however, they are very often constrained by availability of statistics.

1.2.1 Country set

The estimation of an econometric equation using the data for a set of countries assumes that the relationship studied does not differ significantly between the countries of the sample. In other words, as far as we are concerned here, it assumes that the differences between the observed growth rates are explained by the different values assumed by the independent variables for the various countries.

This implicit hypothesis of structural homogeneity of economic relationships would call for systematic tests. But the econometric studies using cross-sectional data are generally accompanied by a much more limited number of diagnostic tests than the studies done using time data. Most of the customary software produces, for example, the Durbin and Watson statistic, which has no clear significance in cross-sectional analysis. However, the pertinent tests for this type of research, such as the coefficient stability test between two subsamples due to Chow (1960), or the homoscedasticity tests that bring out the variability of the residual variances between the different observation points -- and therefore that of the coefficients, according to Breush and Pagan (1979) -- generally call for supplemental work by the investigators. They would therefore be very helpful for justifying econometric analysis using cross-sectional data by means of a given model or, on the contrary, for excluding certain countries from the sample.

Whereas including a country in a sample implies the hypothesis of homogeneity, the fact of excluding a country does not necessarily imply a hypothesis of structural heterogeneity. It may simply reflect the investigator's tastes or limits on the availability of data. To be tested, the homogeneity hypothesis requires that the model be estimated with and without the countries in question.

However, the econometrician is tempted to include the largest possible number of observations in the sample in order to have sufficient degrees of freedom to apply statistical tests under satisfactory conditions. The temptation to do so can sometimes conflict with the homogeneity requirement stressed earlier. It can also be pointed out that the exclusion of a country from the sample used (taking into account the cost in terms of degrees of freedom that that implies) might reveal an implicit heterogeneity hypothesis. Generally speaking, however, the literature does not contain detailed justification of the choice of the sample analyzed, and a wide variety of criteria have been applied.

Sets and subsets

Cross-sectional analyses of growth are generally based on a sample composed exclusively of developing countries (cf. table 1, column 3). However, some studies include industrialized countries in the sample (Fry and Lilien 1986, Genberg and Swoboda 1987, Hwa 1983,

Kormendi and Meguire 1985, Landau 1983, Marsden 1983, Ram 1986, Venieris and Gupta 1983). This implies a homogeneity hypothesis whose significance can be variously interpreted, e.g. according to the nature of the independent variables concerned. For example, the impact of initial per capita product on growth rate can vary with level of development: whereas the catch-up hypothesis, implying a negative impact, may be more apt when a certain level of development is attained; below that level a lower per capita income can mean a handicap, associated for example with a lower human capital, and hence a positive impact. The literature in fact contains both positive and negative results, depending on the composition of the sample: a negative impact when the developed countries are included (Kormendi and Meguire 1985), positive with only the developing countries (Singh 1985) but also negative with only the developing countries (Landau 1986). An econometric solution to this problem can be sought in the estimation of nonlinear relationships, following Chenery and Syrquin. This alternative makes it possible to measure the respective weight of the two but not to define the way in which each influences the results.

The same problem arises, but to a lesser degree, within the set of developing countries. A number of cross-sectional studies relate to only some of the developing countries, either the middle-income or semi-industrialized countries (Feder 1983, 1986) or the low-income countries (Helleiner 1984), while some estimate the relationship for different incomes-(Demeocq and Guillaumont 1985, Kavoussi 1984). The distinction between subsets of countries at different income levels can also be used to test the hypothesis that the transmission mechanisms differ according to income (Feder 1986, Kavoussi 1984).

The distinction between sets of countries at different income level partially overlaps the distinction between geographical subsets (Africa, Latin America, Asia). Some studies relate only to the countries of a given continent (e.g. Africa, Wheeler 1984 or Helleiner 1984; Asia, Rana 1987). Others estimate the relationship for several geographical subsets (Faini, Annez and Taylor 1984, Demeocq and Guillaumont 1985). In still others the African countries are de facto eliminated (e.g. Kormendi and Meguire 1985).

Examining the factors affecting growth separately for a regional subset comes down to making the hypothesis that these factors operate differently in different regions of the world. These hypotheses may be based on historical or geographical considerations but the latter do not always emerge clearly. It is true that the results obtained can vary appreciably from one regional subset to another, as is evident from our illustrative model (table 3, equations 18 through 21). Some studies have sought to take account of regional specificity by introducing a dummy variable corresponding to each regional subset (Singh 1985); however, this method does not capture a possible regional specificity of the impact of the various independent variables affecting the regression coefficients.

An important problem arises when one seeks to explain the causes of growth or stagnation in a given region of the world, as Wheeler does with respect to Africa. It consists of determining whether, in order to identify the causes of the stagnation observed in these countries more than elsewhere in the world, it is appropriate to reason solely from the African subset or from all the developing countries. If the homogeneity hypothesis can apply to all the developing countries, including the African countries, the causes of African stagnation can be sought in the level of the variables affecting growth. But if these causes stem from a certain specificity of the model applicable to Africa, it is preferable to work on a sample limited to that region. However, this specificity hypothesis must itself be tested by reference to a larger sample.

Aberrant data points and weighting

Finally, the heterogeneity of a sample is sometimes due essentially to a single country or a small number of countries. This is the problem of "outliers," which involves two questions: how to detect aberrant data points that affect the estimate, and how to take them into account.

Heterogeneous data points can exist in the sample that do not significantly affect the estimate; in that case they do not need to be eliminated. Unfortunately, the outliers that have the greatest impact on the results are those that are both the most useful and the most difficult to detect. Detecting them cannot be done solely on the basis of the size of the residuals since it is possible that an aberrant data point will not lie far from the regression line. On the contrary, the countries characterized by "high" residuals (in absolute value) are in a way "disregarded in the estimate." With our illustrative model we show (table 3, equations 22 through 25) how successive elimination of the four data points with the largest residuals has little impact on the values assumed by the estimated coefficients. It is noted, however, that the public expenditure ratio becomes significant at 10% when Botswana and Syria are eliminated and that per capita income also becomes significant.

When economic considerations cause a country to be singled out, its exclusion can sometimes have a particularly significant impact. For example, in Kormendi and Meguire (1985), the exclusion of Brazil sharply reduces the significance of the variable "average rate of growth of money supply" and the value of its coefficient. In our illustrative model the exclusion of Singapore, suspect because of its exceptional export share, causes a substantial change in the coefficient estimated for impact of exports on economic growth (equation 25). This leads to a second important observation concerning aberrant data points: their presence is often detected by economic reasoning, which sometimes, by the same token, justifies eliminating them from the sample. It is true that more formal methods also exist for detecting them and testing their heterogeneity on the basis of "Studentized residuals" (Barnett and Lewis

1978, Cook and Weisberg 1982). But they do not appear to be in very common use yet. Once the aberrance of an observation is recognized, by one means or another, eliminating it is not the only way to resolve the problems it poses. It can also be weighted in order to conserve the information it contributes while reducing its impact.

The technique of weighting the different variables can be applied in a completely different spirit, as does Landau (1983). He considers that it is appropriate to weight the various observations by the size of the country's population. The econometric rationality of this procedure is not very clear since there are two possible causes: either the sample is homogeneous, and changing the weighting of the countries does not have much effect, or it is not, in which case the very justification for the use of a cross-sectional sample in the estimation is in question.

But the very concept of weighting has to be examined in light of the purposes of the study. If the aim is to test the impact of certain variables in order to assess the efficacy of certain economic policies, there is no reason a priori to give greater weight to some national experiences than to others. But the purpose of the study may be different. It might be felt that in a certain sense it is more "important" to understand the growth of India than that of countries with very small populations. But in a similar spirit it could be argued that weighting the observations by the inverse of per capita income would be more justified since in a certain sense it is more "important" to understand the growth of the poor countries than that of the rich countries. The number of the weighting criteria could be multiplied in this way.

1.2.2 Choice of period

The length of the period over which the growth rate is calculated normally depends on the purpose of the study. Most of the studies are concerned with long-term growth. It is exceptional for authors of cross-sectional growth analysis to aim at explaining both fluctuations (or cycle) and growth; this applies to Fry and Lilien 1986. It is normal in this latter case for the dependent variable to be an annual growth rate calculated over a short period (mobile two-year average); the interest of Fry and Lilien in product fluctuations is closely linked to the purpose of the study, i.e. an examination of the impact of anticyclical monetary policy on growth. The purpose can also be to explain medium-term growth performance, for example in response to the oil shock, as does Balassa (1985) in introducing ways of adjusting to the oil shock as independent variables.

The long or medium period over which most of the authors calculate the growth rate in fact varies in length. Our sample of articles includes (in roughly equal proportions) studies covering 20 years, often divided into two subperiods, others that work on 10 years (apparently the commonest length) and still others that are limited to

less than 7 years. There are even that seek to capture long-term characteristics by calculating growth over a single year (cf. table 1, column 4).

All in all, authors show a certain preference for ten years as the appropriate unit of time. This preference appears to reflect a compromise between two aims. One aim is to investigate the longest possible period in order to erase short-term fluctuations and also to capture the impact of the variables even if they take a long time to act. The other leads to shortening of the calculation period so that the broad orientations of economic policy, which can change over the course of time, can be expressed in a significant way. For example, countries like Brazil and South Korea have experienced contrasting economic policy phases over the course of the last thirty years. To then take an average rate over the entire period to characterize economic or budgetary policy or openness to the outside world rather poorly characterizes the policy followed and consequently does not capture the impact of a given policy. The technique of introducing a variable representing instability of the economic policy in question only partially resolves the problem since this variable makes it possible to measure the impact of the variability of the policy but not to assess the relative efficacy of the various types of policies successively applied. In brief, the length of the calculation period is a fundamental factor in interpreting regressions.

The homogeneity of the period covered is sometimes sought by choosing a historically defined period. For example, some studies (e.g. Rana 1987) distinguish between the period preceding and the period following the first oil shock. The distinction often drawn between the 1950s, the 1960s, and the 1970s itself demarcates notably different phases of economic history: the late 1950s marks the end of the dollar scarcity and the return to convertibility of European currencies; in contrast, the late 1960s marks the onset of international monetary instability, of world inflation and of the rise in unemployment in the industrialized countries; the end of the 1970s and the beginning of the 1980s ushers in a new phase of the international economy characterized by disinflation and reduction in the availability of international capital.

The studies that compared the equations estimated over two periods usually stress the difference in results, particularly those of Genberg and Swoboda (who distinguish between 1970-77 and 1977-83) and Singh (1985); in contrast, others find that they are similar (Hwa 1983). The fact that a difference is found can be interpreted differently, depending on the purpose of the study: the problem is to know whether the observed instability of the model estimated, depending on the period, is a failure of the underlying theory or its modelization or whether, on the contrary, it brings out the role of factors placed in their historical context.

1.2.3 Data pooling

A number of studies combine cross-sectional observations with time series. This practice of "pooling" has been used by various authors, though in different ways. Some have simply combined the observations relating to two multiannual subperiods (Genberg and Swoboda 1987, Singh 1985); it is then a matter of a stability test of the relationships estimated for each of the subperiods, a problem evoked earlier. The other studies introduce a series of observations for each country, usually calculated for a small number of years (one year, Devarajan and de Melo 1986, Rana 1987, Faini et alia 1984; an average of two years, Fry and Lilien 1986; successively 1, 4 or 7 years, Landau 1986). The purpose of pooling is usually to increase the number of observations; more rarely it is to capture both short-term and long-term effects (Fry and Lilien 1986).

But when pooling is done using a short-period growth rate as dependent variable, it is necessary to define the structure of the time lags for the impact of the different independent variables on the growth rate. For example, if the investment rate is introduced to explain the growth rate of the same year, the Keynesian effect on demand is likely to be captured rather than the long-term effect on productive capacity. But pooling analyses of growth, although referring generally to a long-term model which implies long time lags of the independent variables, often pay little attention to the appropriate impact of the lag structure. The problem of time lags also arises logically for cross-sectional analysis but its practical importance is less, the longer the period of calculation of the growth rate.

Moreover, pooling poses the problem of sample homogeneity particularly acutely. To the problem posed by heterogeneity of the data in space is added that of possible heterogeneity in time, i.e. that of instability of relationships over time. In this case, even more than in that of purely cross-sectional analysis, certain diagnostic tests would appear to be necessary (Chow test, heteroscedasticity test, Breush and Pagan test, etc.). To capture any country heterogeneity one can use the "fixed effect" method (dummy country-variable) Devarajan and de Melo 1987 and Faini et alia 1984); in cross-sectional analyses, dummy variables can obviously only be used to characterize groups of countries. To capture heterogeneity over time, some authors introduce a trend variable (Devarajan and de Melo 1986).

Whatever the precautions that have to be taken in using pooling, the estimation of our illustrative model using this technique (transition from 40 to 280 observations) indicates that the results are not fundamentally changed (see table 3, equations 28 and 29).

x

x x

The illustrative model used to test the impact of the various choices concerning the dependent variable revealed that the choice pertaining to the composition of the sample is essential and the other choices less significant. This does not mean that another model would not have led to different evaluations. It also emerges that most of the others who tested the homogeneity of relationships over time, rejected it.

2. Choice of Independent Variables: Characteristics of the Model

Cross-sectional analyses of growth seek to answer a wide range of questions (see table 1, column 1). They do not, as a rule, aim to provide a general or exhaustive overview of factors affecting economic growth in the developing countries, but to highlight the particular role of one or another variable and derive implications for economic policy from it. The independent variable whose impact is chiefly analyzed is then either a variable directly representing economic policy (tax ratio, budgetary expenditure ratio, growth of money supply, overvaluation of exchange rate, etc.) or some other variable that affects growth and can be influenced by economic policy (growth of exports, their instability, external capital inflows, population growth, education, health, growth of agricultural production, etc.). Moreover, some studies seek to apportion economic growth between the part attributable to constraints imposed by the environment (external or internal) and the part determined by economic policy choices.

The purpose of the study influences not only the nature of the independent variables but also the way in which they are combined in a model. The interpretation of economic results is conditioned by these two methodological choices, which we shall now consider in turn.

2.1 Choices concerning definition of variables

Examination of the literature on cross-sectional analysis of growth reveals that the choice of independent variables is affected by two major kinds of problems:

- the variables are difficult to classify and their nature is sometimes uncertain;

- they are measured in different ways and their international comparability is not always ensured.

2.1.1 Classification and nature of variables

A number of classifications of independent variables affecting growth can be found in the literature (production and productivity factors, short-term and long-term factors, external and internal factors, etc.). To be able to extract lessons from cross-sectional studies concerning the economic policy most favorable to growth, we need

to distinguish between economic policy variables and "fundamental" or environmental variables. As used here, environment means the entirety of the factors that are independent of discretionary economic policy choices (or "exogenous" factors in relation to economic policy). This distinction is not the same as that between international and domestic factors: the environmental variables group together not only international factors, such as evolution of terms of trade, but also certain domestic factors, such as climate, dimension, natural resources, etc.. The distinction between international factors and domestic factors, often used in global studies of the impact of North-South relations, is hardly used at all in cross-sectional analysis of factors affecting growth. The main reason is that the purely international factors affect all countries and it is often impossible to differentiate their impact according to country (growth of world demand, world inflation, and so on).

Although the distinction between country-specific environmental variables and economic policy variables is an essential one, it is rarely made explicitly (it is found in Wheeler 1984, Plane 1986, Guillaumont P. and S. 1986 and, to some extent, Genberg and Swoboda 1987).

Thus, the distribution of the variables between these two categories is not obvious. This presents hardly any problem in the case of the environmental variables representing initial conditions, such as initial product per capita, initial population size, initial school enrollment rate, initial structure of production or exports, etc.. While these variables are influenced by economic policy, they are not affected by the policy followed during the period considered.

A problem arises in regard to the environmental variables measured over the same period as economic growth. Examples are population growth and instability of exports. These variables are not totally independent of economic policy. Population growth can be affected not only by birth control policy but also, in the shorter term, by migration flows, which depend on economic growth and therefore on economic policy. In that connection, natural population growth is a better environmental variable than total growth; however, it is rarely used (it occurs in Plane 1986). Similarly, while the instability of exports undoubtedly results mainly from international factors (price and demand fluctuations) or climatic hazards, it is also affected in the long term by diversification policy and in the short term by producer price policy -- itself linked to monetary and budgetary policy.

Conversely, the economic policy variables are usually influenced by the environment. Thus, in cross-sectional analysis the economic policy instruments used, which vary from country to country, cannot be introduced directly; indicators are then used that result from the use of various instruments and from the environment. Examples are the customary monetary and budgetary policy indicators (e.g. rate of growth of money supply or inflation rate, which depends in part on the

evolution of international prices, or tax ratio, which depends in part on the initial structure of production). This effect of the environment is even more obvious in the case of indicators meant to represent a strategy, for example in favor of agriculture, through rate of growth of agricultural production, or a strategy of openness to the outside world, through rate of growth of exports. It is not enough to establish a positive relationship between the rate of growth of GDP and that of agricultural production or that of exports in order to justify a policy favorable to agriculture or an openness policy. That entails the risk that a situation will be regarded as resulting from a policy when in fact it results in part from the starting conditions.

Moreover, certain environmental variables that significantly affect the growth rate undoubtedly do so by reason of the economic policy reactions that they usually -- even though avoidably -- generate. This is true of the instability of export receipts in particular (Demeocq and Guillaumont 1985).

Separate treatment has to be given to the purely political factors, whether that of the more or less democratic nature of the political regime (taken into account by, for example, Venieris and Gupta 1983 and Kormendi and Meguire 1985) or that of political instability (coups d'etat, war, violence, etc.) (Wheeler 1984, Venieris and Gupta 1983). These factors can be regarded as either environmental variables or economic policy variables, depending on the purpose of the analysis: in an analysis of the efficacy of economic policy as an intervention technique, they form part of the environment (Wheeler); in an analysis of development strategies they can be deemed to result from human choices and must therefore be treated as policy variables.

Generally speaking, it seems that the political conclusions to be drawn from cross-sectional analyses would be more reliable if greater attention were paid to the nature of the environmental variables and their linkage with autonomous economic policy decisions.

2.1.2 Measurement and international comparability of variables

Regardless of the nature of the independent variables, the cross-sectional studies reveal substantial difficulties in measuring them on a comparable basis in different countries. These difficulties have been overcome in a variety of ways and more or less well.

The variable measured is very often no more than an approximation ("proxy") of the initial concept. A good approximate variable has to be correlated with the variable it replaces yet in such a way that the percentage of error is not itself a function of the growth of the product one seeks to explain. Many approximate variables no doubt fall victim to this risk. Thus, gross investment is often used in place of variation in capital for lack of a measurement of capital: the error introduced concerns the depreciation rate which can itself be a function of the GDP growth rate (thus, a period of rapid growth can

lead to accelerated depreciation of capital). The solution of using growth of investment as "proxy" (Tyler 1981, Marsden 1983, Hwa 1983) is even less satisfactory since it assumes that the sum of capital growth rate and capital depreciation rate is constant. 3/ The problem is just as great when rate of growth of employment is replaced by rate of growth of active population or (even more commonly) of total population: the faster the growth, the more the unemployment rate normally declines, so that employment rises faster than population.

The choice of an approximate variable can present a problem that is not just econometric but has to do with the very significance of what it is sought to represent. To express the full natural and human resource endowment of a country (natural resources, infrastructure, education, health, etc.), the yardstick of per capita product is used. Now the relationship between these various conditions and per capita product can be fairly remote (in 1960 South Korea had a low per capita product but a high school-enrollment rate which no doubt contributed to its development); moreover, per capita product depends both on the environment and on the policy followed previously: the growth capacity for a given low initial per capita product differs according to whether this initial level is due to natural conditions or to poor policy (for example, Niger and Madagascar had the same per capita product in 1985).

To capture qualitative factors that are difficult to measure, a number of authors use dummy variables. These are often sociopolitical or institutional variables: violence, democratic situation, climatic zone, membership of a geographical area, etc.. More rarely, it is a question of representing a threshold effect for variables that are in fact measurable (for example, evolution of terms of trade, Wheeler 1984, or per capita income, Ram 1985): the approximation is then that of a logistical transformation of the variables. The dummy variables sometimes have a very significant impact, to the detriment of other variables (for example, in explaining investment rate in Kormendi and Meguire 1985). In brief, the dummy variables not only are by definition imprecise but also they often substantially affect the estimation results. They reveal in fact a heterogeneity of the sample without making it possible to capture any relationship that may exist in homogeneous subsets of the sample.

A specific difficulty arises in comparing variables meant to represent a deviation from a normal or equilibrium position. This applies in particular to price distortion indicators. Some studies have sought to take account of the impact of overvaluation of currencies on growth (Wheeler 1984, Agarwala 1983). In view of the difficulty of defining the country-specific base year it may be tempting to adopt the variation in the real effective exchange rate as an approximation (Wheeler 1984); however, this approximation is itself disputable since it no longer corresponds to the underlying theory, which considers not the variation in the exchange rate but its level in relation to an optimum. The problem would be analogous if one desired to introduce a variable representing deviation in agricultural producer prices from an

optimum: using the variation in prices would then be an unreliable approximation. For that reason, nominal rates of protection of agricultural products are sometimes introduced (relationship between producer price and farmgate equivalent of world price) (Agarwala 1983); however, a difficulty then arises because the available data usually relate to different years, depending on the country concerned, and therefore to different international price levels, which alters the significance of the protection rate.

The difficulty of measuring price policies on a comparable basis explains why cross-sectional analyses of growth have paid little attention to this essential field of economic policy. More generally, this difficulty applies to the entire regulatory domain of economic policy (control of prices, of wages, of imports, regulation, etc.); very exceptionally, a "government intervention" variable is introduced (Singh 1983 uses an indicator of Bornshier and Heintz 1979, established in the form of a scale that takes into account both the "general role of government in industry" and nationalization policy).

A final type of measurement difficulty needs to be stressed. It stems from the fact that the significance of certain economic policy variables is closely linked to a country's specific institutions and sociopolitical structures. For example, the public expenditure ratio is generally measured by reference to the central government account, which covers different categories of public expenditures depending on whether the state is unitary or federal; including when the expenditures of the federated states means taking into account expenditures that are included elsewhere in local authority expenses. Similarly, the value of using a particular interest rate (the Central Bank discount rate or a bank deposit interest rate) varies with the countries' financial structures; that is no doubt why a variable of this type is not usually introduced into cross-sectional growth studies (an exception is provided by Lanyi and Saracoglu 1983), although it has often been attempted, not without difficulty, to use it to explain the saving rate.

In sum, it is important to take economic policy into account in cross-sectional analysis of growth, and such analysis benefits from the progress made in the measurement of pertinent comparable indicators; but it is unrealistic to hope to be able to capture all aspects of economic policy in a comparable way.

For that reason many studies use variables that do not correspond directly to economic policy instruments but derive from the use of multiple instruments. The drawback of these intermediate policy variables (such as export ratio or rate of export growth or of agricultural growth) is that, as we saw earlier, they are also influenced by the environment and do not represent only discretionary economic policy decisions. It has also sometimes been considered that the residual of a growth-rate equation in which most of the environmental variables capable of influencing growth are introduced, would be an indicator (admittedly very approximate) of the effects of

economic policy as a whole in each country of the sample (Plane 1986, Guillaumont P. and S., Plane 1987). More precisely, the residual relating to each country represents the impact of the country's economic policy to the extent that it differs from the average policy followed in the sample as a whole. The drawback of this indicator is that its validity is based on the hypothesis that the environmental variables introduced into the function are exhaustive (cf. Azam 1986).

2.2 Combination of variables

It is undoubtedly important to define each independent variable properly. But the interpretation of the estimated coefficients and the policy conclusions that can be drawn from them depend on the way in which these variables are combined in the model. On this combination depend both the judgment that can be made concerning the place of economic policy in relation to the environment factors, and the assessment of the mechanisms by which their effects on growth are transmitted.

2.2.1 Relative impact of economic policy variables and environmental variables

If economic policy variables representing the various decisions of government were available, there would be hardly any problem in assessing government responsibility with respect to growth, taking into account the environmental constraints. But, as we have seen, these (multiple) decisions are difficult to represent in a comparable way. For this reason the variables used are usually intermediate economic policy indicators. The problem, discussed above (2.1.1), is then that these variables are not pure economic policy variables; they are affected in part by environmental factors which, moreover, help to explain economic growth.

To try to distinguish clearly between the respective effects of the two types of variables, the impact of economic policy decisions can be isolated by purging the policy indicators of the effect of the environmental factors. To that end the intermediate economic policy indicator is regressed on the environmental variables that affect it and the regression residual is used as the indicator of economic policy choice. The residual is assumed to represent the discretionary element in economic policy, which is equivalent to considering that a "normal" policy in relation to the totality of the countries of the sample (zero residual) contains no discretionary element.

A measurement thus purged of the policy followed has been made by Chenery and Syrquin (1975) for openness to the outside world (residual of an equation explaining the export ratio as a function of per capita income and of population) in order to characterize the development mode, but without estimating a growth equation. It has been possible to extend this measurement to a large number of variables representing economic policy (tax ratio, public expenditure, growth of money supply, investment rate, etc.) by introducing environmental factors chosen specifically for each indicator (CERDI 1986).

These types of indicators can be introduced as independent variables explaining the growth rate (Balassa 1985 for the residual of per capita exports; Guillaumont P. and S. 1986 for the residual of the export ratio and of the investment rate). The coefficient estimated for this variable represents appropriately the impact of the economic policy choices made. In contrast, the coefficients estimated for the environmental variables express both their direct impact on growth and the impact exerted through the intermediate economic policy variable. Thus, this transformation of the growth rate equation generates a change in the environmental variables coefficient but not in the economic policy coefficient. 4/ The part of a country's rate of growth of product that is attributable to the economic policy choice--in other words to economic policy to the extent it is discretionary or differs from the norm--is represented for the country by the product of the value of the new variable (the residual) and its coefficient.

2.2.2 Transmission mechanisms and levels of analysis.

Most cross-sectional studies of growth factors are concerned with supply determinants. Here again, the reason is not always clearly explained. Some authors consider that demand factors act on the world level and affect the various developing countries indiscriminately, others that demand variations affect production only in the short term, thereby explaining deviations from trend (cf. Genberg and Swoboda 1987, pp. 24-25). An exception is furnished by the study of Faini, Annez and Taylor (1984), based explicitly on demand factors.

The most commonly used reference -- explicit or implicit -- is a production function. But this reference takes very diverse forms. Two broad types of models can be distinguished. The first group introduces supply of production factors (as control variables) in order to isolate the productivity growth factors. The others are concerned, more upstream, with the variables that affect both productive factors and productivity growth. For the sake of brevity, we shall designate the two groups "productive factor models" and "upstream models," respectively.

Productive factor models

Let us consider first the first group of models, which is the most frequent case. The coefficients estimated for the growth of the two productive factors, capital and labor, do not only express the direct impact of these factors on production in a pure way but also incorporate any indirect impact they have on productivity gains.

The difficulty does not seem to be an important one as far as the interpretation of the capital coefficient is concerned. Generally speaking, the variable is the investment rate. Its coefficient then measures marginal capital productivity if its effects on technical progress are negligible. The coefficients estimated in the literature show rather little dispersion and are of the order to be expected for a profit rate (for example, 0.13-0.16, Ram 1985; 0.11-0.13, Ram 1986; 0.18-0.20, Feder 1983; 0.05-0.15, varying with development level, Feder 1986; 0.15-0.16, Venieris and Gupta 1983.

In contrast, the coefficients estimated for labor growth vary substantially from one study to another: the coefficient may be significant, ranging from 0.4 in Kavoussi 1984 and Ram 1986 to 1.1 in Ram 1985, via intermediate levels such as, for example, 0.61 in Kormendi and Meguire 1985, 0.6-0.7 in Feder 1986, etc.) or insignificant (Balassa 1985, Genberg and Swoboda 1987, Marsden 1986 and, for low-income countries, Helleiner 1984). This reflects not only the fact that, as already noted, a very approximate variable frequently replaces growth of employment but also the existence of varying impacts of employment growth (or population growth, taken as "proxy") on productivity growth. In a number of studies a higher coefficient is estimated for the low-income countries than for the medium-income or semi-

industrialized countries (Feder 1986, Kavoussi 1984, Ram 1985, Rana 1987). This result, which is not obviously explained by a relatively larger share of labor income in the low-income countries, can be interpreted as the manifestation in those countries of a greater positive impact of population growth on productivity growth. (Conversely, when the coefficient is not significant, the result can be interpreted as reflecting a negative impact on productivity gains which cancels out the direct impact on production.) 5/

Sometimes the dependent variable is growth of per capita product (Landau 1983, 1986, Venieris and Gupta 1983). In these studies the population growth rate continues to be included among the independent variables and its coefficient is negative -- significantly in two cases (Landau, -0.5 to -0.1, Venieris and Gupta 1983, -0.2).

In addition to the growth of productive factors, various other independent variables are introduced into the models with the aim of explaining productivity growth. It appears that the impact of the fundamental or environmental variables, such as size, initial per capita income, or oil resources, is not usually the focus of interest of the investigations and that they are introduced as control variables and not as test variables.

The test variables can be divided into two groups. The first group of variables deals with the impact of a sector on the whole economy. They are represented by growth of the manufacturing sector (Feder 1986), of the agriculture sector (Hwa 1983, Genberg and Swoboda 1987), of the export sector (Feder 1983, 1986, Genberg and Swoboda 1987, Kavoussi 1984, Lal and Rajapatirana 1987, Moran 1983, Ram 1985, Rana 1987) or again of the public sector (Ram 1986). The expected impact of this sectoral growth is of two kinds, as emerges clearly from the model of Feder (1983). First, if the sector in question is more efficient than the rest of the economy, the reallocation of resources in its favor increases overall factor productivity; this hypothesis is sometimes described as disequilibrium growth (Chenery 1986, Feder 1986): it assumes differing marginal factor productivity from sector to sector and therefore segmentation of factor markets. Second, the most dynamic sector can generate external economies: for example, the export sector causes the other sectors to benefit from a better trained labor force, more modern management techniques, foreign exchange, etc. The impact of these variables is usually positive. It is reassuring to note that no sector was seen to exert a negative influence on economic growth (agriculture and industry, exports and public expenditures). Attention is drawn, however, to a certain discord in the literature concerning the impact of exports on the growth of the low-income countries (Helleiner 1986, Goncalves and Richtering 1986). 6/

The second group of variables, whose impact is estimated on the growth of productivity, comprises economic policy variables. These variables are distinct from the sectoral variables, although the latter are also linked to economic policy. The link is particularly evident

where exports are concerned. Thus, export growth prior to the period of analysis is often adopted to express openness as a choice (Lal and Rajapatirana 1987). But openness can be measured by means other than growth of exports and can be introduced alongside it (Balassa 1985). Another aspect of openness is represented by external aid or private foreign investment, which generally have a positive impact (Faini et al 1984, Singh 1983, Rana 1987) or an insignificant one (Balassa 1985). The monetary policy variables are introduced into a few studies and their coefficient has the expected sign: negative for inflation (Landau 1983, 1986, Hwa 1983), its variability (Genberg and Swoboda 1987) or its acceleration (Kormendi and Meguire 1985), or again for rate of growth of money supply or its standard deviation (ibid).

The results of the impact of the role and size of the government on productivity are less uniform: while the impact of taxes appears to be negative (Marsden 1983), as does that of government intervention (Singh 1985), contradictory results are noted for public expenditure. Thus, Landau (1983, 1986) finds a negative impact for various public expenditure/GDP ratios, including public investment expenditure; Genberg and Swoboda (1987), in contrast, obtain for these same public investment expenditures a positive impact (but negative for the overall rate of public expenditure); Ram (1986), as we saw earlier, obtains a positive impact for public expenditure growth rate whether or not it is weighted by public expenditure ratio. This apparent contradiction can no doubt be explained in part by the definition of the variables, which obeys two different hypotheses. Ram, through variation in public expenditure, is concerned with a "Feder-type" sectoral impact, described earlier, whereas Landau, through the average level of the ratio, investigates the impact of various categories of expenditures on economic efficiency. But when Kormendi and Meguire introduce the rate of growth of the public expenditure ratio, the impact appears to be negative: the authors interpret this variable as reflecting the negative impact of the taxes on the level of production.

Widely varying results are also found when sociopolitical variables are introduced: while "civil liberty" is a positive factor for Kormendi and Meguire (1985), "democracy" is a negative factor for Landau (1986), as is political instability for Venieris and Gupta (1983). These results must not be cited without recalling the uncertainty that besets the definition and measurement of these variables (cf. section 2.1.2 above).

Upstream models

A second category of models, designated above "upstream models," is characterized by the absence of variables representing productive factors. In these models the coefficient of the independent variables is meant to represent the impact exerted by these variables on the growth of productive factors as well as on productivity. A given independent variable can therefore logically have a different coefficient in the two types of models. For example, the inflation rate

used as independent variable in a sample that includes the developed countries in both cases has a coefficient four times as high in absolute value (-0.08) in the study of Fry and Lilien (1986), in which factors of production are not introduced, as in the analysis of Hwa (1983) (-0.02), in which the independent variables include the growth of capital and labor. This difference can be interpreted as denoting a negative impact of inflation on the investment rate. Similarly, the weighted growth of exports appears, by reason of its impact on saving and investment, to have a more favorable impact on growth when it is introduced without the investment rate (coefficient of 1.2 to 1.4 in Demeocq and Guillaumont 1984 but less than unity in the studies combining this variable with the investment rate, for example Feder 1983, 1986). Conversely, the instability of exports, which has a positive impact on the investment rate and a negative impact on capital productivity, entails in total a diminished negative impact on growth (Demeocq and Guillaumont 1986).

A second characteristic of this group of models is that it allows the global impact of the economic policy variables on economic growth to be distinguished from that of the environmental variables, both groups acting on growth of productive factors and on productivity. In this perspective the environmental variables receive more attention than in the first category of models and are more diverse: in addition to population, per capita product or existence of oil resources, variables may be introduced representing climate (Landau 1983, Plane 1986), human capital (Agarwala 1984, Guillaumont P. and S. 1986, Landau 1983, Plane 1986), terms of trade (Plane 1983, Wheeler 1983), political instability (Wheeler) and so on.

The significance of population growth in this context needs to be clearly defined: it is no longer a variable regarded as an approximation of growth of employment but one capable of affecting employment, investment rate and productivity simultaneously. It is, moreover, sometimes replaced by natural population growth to the extent that immigration is in part induced by growth or by economic policy (Plane 1986). It should be noted that the population growth rate does not always turn out to be significant, either because its wide-ranging impact can mutually compensate or because the presence of per capita product, with which it is linked, captures part of its impact on economic growth. Similarly, human capital, measured by literacy or school enrollment level, life expectancy or child mortality rate, reflects a certain state of initial conditions or development level: it is then very much a matter of an environmental variable and not of the variation in a productive factor, human capital, which in the case at hand would be difficult to measure. Through these variables analysts seek to identify an explanation of growth that is located more "upstream" in the hierarchy of causes and thereby more qualitative than the analyses that focus on production factors. The limitation on this type of explanation lies, of course, in the impossibility of quantifying the impact of variables that are perhaps more fundamental, such as value systems and motivations.

The economic policy variables are themselves more diversified in this second category of models than in the productive factor models. Some authors, such as Fry and Lilien (1986), use many different monetary policy variables (seven variables representing monetary policy which turn out to be simultaneously significant). Agarwala (1984) uses a price distortion variable which is a synthesis of seven special indicators. As we have seen, the impact of price distortions on growth has rarely been estimated due to the difficulty of measuring them properly; when they are introduced, their impact is perhaps better captured in a model in which the investment rate does not figure, since these distortions can affect investment rate as well as productivity.

To obtain an approximate idea of the impact exerted by economic policy choices on growth through investment and productivity, respectively, it is possible to use among the intermediate variables, stripped of the effect of the environmental variables, the residual of the investment rate. Thus, there have been introduced, alongside environment factors, the residual of the export ratio, an indicator of openness policy, and the residual of the investment rate, indicator of "accumulation effort" (P. and S. Guillaumont 1986). When the openness indicator is introduced by itself, alongside the environment factors, its coefficient (0.10) expresses the impact of the openness policy both on productive factors and on productivity. When it is introduced jointly with the investment rate residual, its coefficient (0.6-0.8, depending on the sample) no longer reflects the impact of the openness policy on productivity.

The upstream models or "environment, policy and growth" type models moreover offer the advantage that they avoid the problem posed in the productive factors models by the possible endogeneity of the growth of these factors in relation to that of product. A solution to this problem has however been sought in time-shifting of the independent variables (Landau 1986).

Alongside these advantages, the environment, policy and growth models have the drawback that they mask the mechanisms of transmission of the impact of both environment and economic policy on growth, a traditional criticism of the black box of reduced equations.

Reduced equations or structural models

For that reason, some recent studies have analyzed factors affecting growth cross-sectionally on the basis of simultaneous equations based on a structural model. (This can be a single indirect least-squares procedure (Rana 1987), double least-squares (Genberg and Swoboda 1987, Gupta and Islam 1983, Venieris and Gupta 1983) or triple least-squares (Moran 1983)). The advantage of a structural model is of course that it allows capture both of the entirety of the effects of the variables examined and of the way in which those effects are transmitted. Unfortunately, however, the results obtained with cross-sectional analysis using this procedure are statistically insignificant

(Gerberg and Swoboda 1987, Gupta and Islam 1983, Moran 1983). 7/

The reasons for the discrepancy between the apparent quality of the results obtained using the ordinary least-squares method and those obtained using a structural model do not appear to have been explained clearly. One reason is perhaps the following: if the sample of countries is heterogeneous for certain relationships, there is a good chance that the estimation of the simultaneous model will detect it and that the quality of the adjustment will be affected thereby; in contrast, in the reduced form equation the effects of the heterogeneity of the sample on various underlying relationships may tend to compensate each other. Moreover, the fact that cross-sectional series analyses probably give rise to special heteroscedasticity problems (cf. supra) raises the question of whether the resulting loss of efficiency of the estimation is not greater in the double least-squares than the ordinary least-squares method.

Conclusions

Four principal conclusions can be drawn from the foregoing analysis of the main methodological problems that arise in a cross-sectional study of factors affecting growth.

The quality of the available statistical data appears to have a greater impact on the results when it affects the independent variables than when it affects the growth rate itself. The studies examined clearly brought out the need for better statistical knowledge of developing economies. This need is particularly important in the case of the economic policy indicators.

The results obtained appear to be very sensitive to the choice of periods and samples. However, the choice of periods seems to open the door less to arbitrary subdivision. Interpretation of the results of a cross-sectional study of factors affecting growth should be based on an analytical description of the composition of the sample (taking into account not only the number of countries but also their geographic location, development level, political system, etc.). The hypothesis of sample homogeneity must be suitably tested (coefficient stability and homoscedasticity tests).

Interpretation of the results must, moreover, be accompanied by close attention to the way in which the variables are combined in the equation, which reflects the structure of the underlying explanatory model. This attention is crucial to the validity of the economic policy conclusions that can be drawn from examination of the regression coefficients. It is therefore appropriate to explain the theoretical model used, particularly since a number of different growth models can be conceived. The use of a reduced form equation -- currently the commonest practice -- in preference to a structural model involves an

obvious danger in this connection. However, it has to be recognized that simultaneous equation models have not so far yielded satisfactory econometric results.

The policy conclusions that can be drawn from the examination of cross-sectional studies are particularly unreliable as regards the role exercised by government through budgetary and regulatory policy. This unreliability is no doubt attributable simultaneously to lack of suitable indicators, government intervention, heterogeneity of the samples in terms of the countries' reactions to this intervention, and the diversity of the modes of transmission that can be envisaged.

Notes

1/ The problem has been raised by J. Baneth (1986).

2/ A sectoral deflator is defined for each country:

$$Pib = \frac{pib\ Xib}{pij\ Xib}$$

in which:

i = sector index
j = base year of data in the initial document, appropriate to each country
b = (1970, ..., 1981), year adopted as new base year
Xib = production volume of sector i in base year b.

GDP at constant prices in base b is then calculated for each year t as:

$$Y_{tb} = \Sigma i\ Pib\ pij\ Xit$$

3/ We write the increase in capital stock as follows:

$$\dot{K} = I - \delta K$$

in which:

K = capital stock
I = gross investment
δ = depreciation rate

It is δK that introduces a measurement error when we replace $\dot{K}$ by I.

In addition, we can write:

$$I = K \left(\frac{\dot{K}}{K} + \delta\right)$$

In these circumstances, the equality between I and K growth rates implies

that the sum $[(\dot{K}/K) + \delta]$ is constant.

4/ Given the model:

$$Y = a + Eb + Pc + y,$$

in which E and P are the vectors of the variables representing environment and economic policy, respectively, and if there also exist relationships such as:

$$P = g + Eh + p,$$

we obtain:

$$Y = (a + gc) = E (b + hc) + pc + y.$$

In this expression, (b + hc) is the list of the coefficients of the environmental variables, in which the effect of the variables P acts through the medium of the coefficients c. In contrast, the coefficients for economic policy, "purged" of the effects of the environment, represented by the vector p, remain unchanged by this manipulation of the variables.

5/ One author (Singh 1985) introduces investment rate but not population growth. This omission may be due to the fact that per capita income is introduced elsewhere part in the model and captures this influence.

6/ Helleiner's study is criticized by D. Lal and Rajapatirana (1987).

7/ In the case of the indirect least-squares method there is no significance test.

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LIST OF TABLES

Table 1 a

LIST OF PRINCIPAL REFERENCE STUDIES, SHOWING CHIEF PURPOSE

(See summary of each study in table 1 b)

Type of model and principal factors examined	Types of Models		Principal Factors Examined					
	Production factor models	Upstream models (environment and policy)	Budgetary policy and role of govt.	Monetary policy and systems	External financing	Commercial openness	External shocks and export instability	Structure of production
Agarwala 1983		x						
Balassa 1985	x					x	x	
Chenery 1986	x							
Dessocq a.l Guillaumont 1986		x				x	x	
Devarajan and de Melo 1987		x		x				
Faini Annez and Taylor 1984	x			x				
Feder 1983	x					x		
Feder 1986	x					x		x
Fry and Lilien 1986		x		x				
Gendberg and Swoboda 1987		x						
Goncalvez and Richtering 1986						x		
Guillaumont P. and S. 1986		x		x		x		
Gupta and Islam 1983	x				x			
Helleiner 1984	x					x	x	
Hua 1984	x							x
Kavoussi 1984	x					x		
Kormendi and Meguire 1985		x		x				
Lal and Rajapatirana 1987	x					x		
Landau 1983	x		x					
Landau 1986	x		x					
Lanyi and Saracoglu 1983		x		x				
Maradan 1983	x		x					
Moran 1983	x					x	x	
Plane 1986		x						
Ram 1985	x					x		
Ram 1986	x		x					
Rana 1987	x				x			
Singh 1985	x		x		x			
Venieris and Gupta 1983	x							
Wheeler 1984		x						

Table 1 b

ANALYTICAL SUMMARY OF THIRTY RECENT STUDIES

	PURPOSE OF STUDY	PRODUCT TYPE AND SOURCE	CHARACTERISTICS OF SAMPLE COUNTRIES	GROWTH RATE CALCULATION PERIOD AND ANALYSIS PERIOD	INDEPENDENT VARIABLES: FUNDAMENTAL AND ENVIRONMENTAL VARIABLES	INDEPENDENT VARIABLES: SECTORAL OR ECONOMIC-POLICY VARIABLES	INDEPENDENT VARIABLES: VARIABLES REPRESENTING PRODUCTION GROWTH FACTORS	INDEPENDENT VARIABLES: SOCIO-POLITICAL VARIABLES	REMARKS
AGARWALA (1983)	Evaluate effects of price distortion	GDP (World Bank)	31 DCs (+ 75% of population of DCs. excl. China)	11 years (1970-80)	Oil resources + literacy rate +	Price distortion (composite index) -	Population growth +		R-sqr = 0.46
BALASSA (1985)	Combined effects of - commercial openness - policies of adjustment to balance of payts shocks	(World Bank)	43 DCs (low-income + semi-industr. countries)	6 years (1973-79)	Initial per capita income -	Commercial openness (residual of an export function) + Response to shocks + Manufacturing exports +	Population growth n.s. Saving rate +		R-sqr = 0.63 Domestic saving rate + External saving rate n.s.
CHENERY (1986)	Compare different modes of explanation of growth of product and productivity (growth in equilibrium, summarized here, and in disequilibrium: see Feder 1986)	GDP (various sources)	57 countries divided into subsets: 19 developed 7 centralized 31 developing, of which: 9 high perform. 22 average or "typical"	Average annual rate over period varying with country, 5-20 years, covering years 1969 to 1974			Combined contribution of labor and capital factors to growth		0.59 < R-sqr < 0.83 Shows "relative inefficiency of growth processes in an average developing economy" (coefficient of variable = 0.68 but 1.2 for the entire sample)

ANALYTICAL SUMMARY OF THIRTY RECENT STUDIES

	PURPOSE OF STUDY	PRODUCT TYPE AND SOURCE	CHARACTERISTICS OF SAMPLE COUNTRIES	GROWTH RATE CALCULATION PERIOD AND ANALYSIS PERIOD	INDEPENDENT VARIABLES: FUNDAMENTAL AND ENVIRONMENTAL VARIABLES	INDEPENDENT VARIABLES: SECTORAL OR ECONOMIC-POLICY VARIABLES	INDEPENDENT VARIABLES: VARIABLES REPRESENTING PRODUCTION GROWTH FACTORS	INDEPENDENT VARIABLES: SOCIO-POLITICAL VARIABLES	REMARKS
DEMEDCO and GUILLAUMONT (1986)	Impact of export instability on growth and growth factors (saving, external capital inflow, capital productivity)	GDP (World Bank)	56 non-oil-exporting DCs. Several subsamples: 25 African 22 low-income 23 medium-income 43 agricultural exporters	Average annual growth over 22 years 1960-81 and two subperiods: 1960-70 (11 years) 1970-81 (12 years)	Export instability measured in import or domestic purchasing power or export price instability n.s. and export volume instability - (variables weighted by export rate)	Export growth rate at constant prices weighted by export rate +			$0.30 < R\text{-sqr} < 0.67$ varying with sample, period and indices used. Results interpreted, without structural model, in light of observed relationships between instability and production factors (saving, external capital: variable impact) and between instability and capital productivity (negative impact)
DEVARAJAN and de MELO (1987)	Compare growth of franc zone countries with that of comparable developing countries	GNP (World Bank)	75 non DCs, divided into subsets using following criteria: - size - income (high, low) - oil-exporting or -importing - semi-industr. - African --- (11 samples in all)	Pooling annual rate over period 1960-82 and two subperiods 1960-73 and 1973-82		Silent variable for franc zone countries and silent variable for each country			Brings out a more rapid growth of franc-zone countries than of comparable countries but less rapid than of DC's as a whole. Performance better in 2nd subperiod

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FAINI, ANNEZ and TAYLOR (1986)	Impact of military expenditure	GDP (World Bank)	69 countries (regional separations presented, or by development level)	1 year (pooling 1952-70)	Per capita income n.s. Silent variables by country (fixed effect)	Export growth + Variation in military expenditure - (but n.s. for industrial countries) External aid (+ or n.s.)	Population growth + (but Africa -) Capital growth n.s.		R-sqr acceptable for all regional subsamples but <0.31. Model without explicit production function
FEDER (1983)	Show that export growth has a favorable impact on product growth because export sector has higher marginal productivity than rest of economy and because latter enjoys external savings generated by export sector	GDP (World Bank)	Semi-industr. countries in broad sense (31), strict sense (19), excl. oil-exporting countries	10 years Average rate 1964-73		Export growth rate weighted by export share of product +	Investment rate + Population growth rate +		R-sqr = 0.689
FEDER (1986)	Test impacts of manufacturing and export sectors	GDP (World Bank)	30 semi-industr. countries. Test with other subsets (less developed countries)	10 years (1964-73) Test on 1955-63		Weighted growth of manufacturing sector + and weighted growth of exports +	Investment share of product + Population growth rate +		R-sqr = 0.75 Model of same type as FEDER (1983): reallocation of factors toward most efficient sectors and externality

ANALYTICAL SUMMARY OF THIRTY RECENT STUDIES

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FRY and LILIEN (1986)	Study impact of anticyclical monetary policy on short-and long-term economic growth	GDP (IMF)	55 developed and developing members of IMF with populns over 2 million	1 year over period 1960-83 Annual growth rate of a biannual product average Pooling	Silent variable representing industrialized countries - Silent variable representing oil-exporting countries + Rate of variation of oil price Oil-exporting countries + Oil-importing countries - GDP growth rate of two previous years +	Average of annual rates of variation of money supply + Standard deviation of a monetary shocks indicator - Silent variable years 1974-77 - Average annual inflation rate - Rate of growth of loans to government/ domestic credit ratio - Monetary shocks indicator (residual of money supply growth rate estimated as a function of time and of the delayed variable) corrected by its variance +			R-sqr = 0.31

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	PURPOSE OF STUDY	PRODUCT TYPE AND SOURCE	CHARACTER-ISTICS OF SAMPLE COUNTRIES	GROWTH RATE CALCULATION PERIOD AND ANALYSIS PERIOD	INDEPENDENT VARIABLES: FUNDAMENTAL AND ENVIRONMENTAL VARIABLES	INDEPENDENT VARIABLES: SECTORAL OR ECONOMIC-POLICY VARIABLES	INDEPENDENT VARIABLES: VARIABLES REPRESENTING PRODUCTION GROWTH FACTORS	INDEPENDENT VARIABLES: SOCIO-POLITICAL VARIABLES	REMARKS
						Budgetary shocks indicator (residual of credit to government/ domestic credit ratio, estimated as a function of time and of the delayed variable)			
GENDBERG and SUOBODA (1987)	Study the factors in medium-term product growth in order to assess the suitability of the structural adjustment programs	GDP (World Bank)	35 developed and developing countries and 14 developing countries	8 and 7 years Average annual rate 1970-77 and 1977-83 Cross-sectional and pooling study	Agricultural production growth rate +	Public investment rate + Export growth rate + Inflation variability - Public expenditure rate - Various other indicators tried but not significant	Population growth rate + n.s. Investment rate +		Structural model estimation by double least squares Pooling results are poor (owing to changes between the two periods) The results for the DCs alone in double least squares are much "less significant" than with single least squares

ANALYTICAL SUMMARY OF THIRTY RECENT STUDIES

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GONCALVES and RICHTERING (1986)	Discuss the significance of the export growth/economic growth relationship, differentiating according to country	GDP (United Nations)	70 DCs distributed successively into: - income groups - clusters defined by position in relation to axes of average growth of GDP and of exports	22 years Average annual rate 1960-81		Export growth rate			0.14 < R-sqr < 0.81 according to income segment (0.25 for total sample) 0.01 < R-sqr < 0.09 according to clusters
GUILLAUMONT P. and S. (1986)	Distinguish, in growth differences, between: - environmental factors - economic policy factors Through latter, explain "growth performance," defined as residual of growth rate estimated on basis of environmental factors only	GDP (World Bank)	(a) 31 or (b) 47 DCs selected according to statistics availability, the broadest sample using more approx. independent variables	Average annual rate 20 years 1962-81	Population + Initial primary school enrolment rate +	Commercial openness indicator (residual of a function of the export rate) + Accumulation effort indicator (residual of a function of the average investment rate) + (The only independent variables of the functions from which the residuals derive are environmental factors)			The introduction of the "pure" economic policy variables (residuals) into a model in which only the environmental variables appear raises R-sqr from 0.36 to 0.55 in sample (a) and 0.47 to 0.64 in sample (b)

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	PURPOSE OF STUDY	PRODUCT TYPE AND SOURCE	CHARACTERISTICS OF SAMPLE COUNTRIES	GROWTH RATE CALCULATION PERIOD AND ANALYSIS PERIOD	INDEPENDENT VARIABLES: FUNDAMENTAL AND ENVIRONMENTAL VARIABLES	INDEPENDENT VARIABLES: SECTORAL OR ECONOMIC-POLICY VARIABLES	INDEPENDENT VARIABLES: VARIABLES REPRESENTING PRODUCTION GROWTH FACTORS	INDEPENDENT VARIABLES: SOCIO-POLITICAL VARIABLES	REMARKS
GUPTA and ISLAM (1983)	Impact of external capital inflows on saving and growth	GNP (World Bank)	40 or 52 DCs, depending on period covered Also uses subsample: - by income segment - by region	9 years 1965-73 and subsidiarily 1950-60 (11 years)	Per capita product (serving to weight the other variables) + or n.s.		Saving rate + Foreign aid rate + Direct foreign investment rate + or n.s. Other capital inflows rate + Labor force growth rate +		0.44 < R-sqr < 0.53 Also uses double least squares with saving rate function of growth rate but results not significant
HELLEINER (1986)	Show that openness to exterior is not a significant growth factor in low-income nor in African countries but that import-volume instability is an unfavorable factor in Africa owing to lack of liquidity	GDP (World Bank)	2 samples (a) 25 low-income countries (<$410 1980) (b) 24 African countries with income <$660	Average rate 21 years 1960-80	Instability of import volume or instability of export purchasing power n.s. in sample (a) - in sample (b)	Variation in export rate between 1960 and 1980 n.s. Variation in import rate n.s.	Investment rate (average 1960 and 1980) (a) + or (b) n.s. Population growth rate (a) n.s. or (b) +		

ANALYTICAL SUMMARY OF THIRTY RECENT STUDIES

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HWA (1983)	Show the determinant role of agric. growth in industrial growth and consequently the entire economy	GDP (World Bank)	Developed and developing countries 1st period: 56 2nd period: 81 DCs 1st period: 41 2nd period: 68	11 years and 10 years Average annual growth rate 1960-70 1970-79		Agricultural production growth rate + Export growth rate + Inflation rate -	Investment rate + Population growth rate +		1st period R-sqr = 0.66 2nd period R-sqr = 0.61 To evaluate the strength of the estimate, the residual of the function of the growth rate estimated without the agricultural variable was regressed on this same variable
KAVOUSSI (1984)	Study the relationship between export growth and product growth according to development level of the DCs and the nature of their exports	GNP (World Bank)	73 market-economy DCs divided into two samples: - 37 low-income - 36 med-income The oil-exporting countries and those with 1960 populns below 1 million	19 years Average rate 1960-78		Rate of growth of goods exports at constant prices + Ditto, weighted by share of manufacturing exports in total exports for the low-income countries sample - for the medium-income countries sample +	Investment growth rate at constant prices + Population growth rate +		R-sqr = 0.68 total sample The impact studied is chiefly that exerted by growth of exports on factor productivity

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KORMENDI and MEGUIRE (1985)	Test the chief '(particularly the most controversial) hypotheses relative to growth factors	GNP or GDP (accdg to country) (IMF)	46 developed and developing countries (in practice no African countries less South Africa) Exclusion of Brazil as outlier	Maximum 28 years (varying by country) Average rate 1950-77	Initial per capita income - Population growth rate + Standard deviation of rate of variation in real product +	Rate of growth of public expenditure rate - n.s. Rate of growth of export rate + Rate of growth of inflation rate - Standard deviation of rate of change in money supply - Rate of growth of money supply + n.s.	Investment rate +	Civil liberty indicator (silent variable taken from GASTIL 1979) +	R-sqr = 0.64 R-sqr = 0.59 The effects of economic policy are deemed to act through factor productivity
LAL and RAJAPATIRANA (1987)	Confirm and criticise certain tests of exports/growth relationship	(World Bank)	18 low-income countries	12 years Average rate 1973-84		Growth of GDP share of exports from 1965 to 1973 (indicator of openness prior to 1973) +	Investment rate + Growth of labor force +		R-sqr = 0.30

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LANDAU (1985)	Impact of public expenditure (consumption)	Per capita domestic product (Kravis, 1979)	104 - 8 oil exporters = 96	9 years (1961-70) 11 years (1961-72) 13 years (1961-74) 15 years 1961-76)	Per capita income - Oil silent variable n.s. Population n.s. Climatic zone silent variables	Share of public consumption in national product - Share of agriculture n.s.	Human capital (4 variables) + Population growth rate n.s.	Years since independ-dence n.s.	0.70 < R-sqr < 0.86 Double least squares for public expenditure
LANDAU (1986)	Impact of public expenditure (separated into 5 types)	Per capita domestic product (IMF) (suppl. by World Bank)	65 DCs (incl. semi-industr.)	Annual data + 4-year averages + 7-year averages (pooling)	Per capita income - Oil silent variable + Population - Terms of trade n.s. World growth n.s. World inflation n.s.	Share of agriculture n.s. and share of manufacturing n.s. plus other industries n.s. foreign aid n.s. 5 types of public expenditure - or n.s. in which public investment - or n.s. Inflation rate -	Investment share + Population growth -	Colony n.s. Democracy - Years since independ-dence n.s.	0.47 < R-sqr < 0.72 Very large number of variables tried

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LANYI and SARACOGLU (1983)	Analyze impact of interest-rate policy on financial growth and economic growth	GDP (IMF)	21 DCs	Compound annual growth rate 1971-80		Variable representing interest-rate policy: equal to 1: positive real interest-rate countries equal to 0: moderately negative real interest-rate countries equal to -1: highly negative real interest-rate countries Residual of growth rate of real monetary and quasi-monetary receipts, regressed on preceding variable			R-sqr = 0.62

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MARSDEN (1983)	Impact of tax charge on growth of product and of productivity	GDP (World Bank)	20 countries (DCs plus others), excluding OPEC and countries with Marketing Boards 10 high-tax countries -v- 10 low-tax countries 10 low-income countries -v- 10 high-income countries	10 years (1970-79)		Taxation rate -	Population growth n.s. Investment growth +		$0.78 < R\text{-sqr} < 0.88$ Simple regressions plus multiple regressions
NORAN (1983)	Impact of export instability on saving rate and growth rate	GNP and GNP net of exports (source not specified)	30 DCs, including 18 Latin Am. 1 African 8 Asian	Av. annual rate 22, 12, 10 years 1954-75 1954-65 1966-75	Export instability in constant US$ n.s. or instability of export prices and volume + or - or n.s. (different measurements)	Export growth rate +	Foreign saving rate (current a/c deficit) + Domestic saving rate + Labor force growth rate +		Examines first the impact of export instability on productivity growth (function of production) then the global impacts, incl. those exerted through the saving rate (by triple least squares)

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PLANE (1986)	Measure growth performance by the residual of a growth-rate function estimated on basis solely of the factors independent of economic policy and evaluate the impact of membership of franc zone by comparing the residuals of the zone countries with those of other countries	GDP (World Bank)	54-61 DCs, depending on available data	Av. annual rate over 20 years (1962-81) 9 years (1962-70) and 12 years (1970-81)	For 1962-81 - initial per capita GNP + - residual of initial juvenile mortality rate (estimated on basis of per capita GNP) - - initial population + - natural population growth rate + - terms of trade trend -				0.40 < R-sqr < 0.55 The "performance" of the franc zone (evaluated on basis of residuals) appears to be close to that of the other DCs and better than that of the other African countries
RAM (1985)	Study the role of exports in growth; amplify the previous studies by: - enlargement of the sample - special analysis of the situation of the low-income countries - comparison of the impacts of export growth before and after 1970	GNP (World Bank)	73 DCs	11 years and 8 years Av. growth rate 1960-70 1970-77	Silent variable for low-income countries -	Export growth rate	Active population growth rate + Investment rate +		R-sqr = 0.53 (1960-70) R-sqr = 0.51 (1970-77) Use of White test to assess hetero-scedasticity risk

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RAM (1986)	Impact of govt. on level of productivity (and not on its growth)	GDP (Summers and Heston 1984)	94 DCs + 21 developed = 115 (DCs then separated)	11 years 1960-70 1970-80		Public expenditure growth rate + and/or ditto weighted +	Population growth rate + Share of investment in income +		0.35 <R-sqr < 0.45 Model inspired by FEDER (1983): reallocation effect plus externality
RANA (1987)	Examine the impacts of external aid and private capital inflow on growth	GDP (IMF, IFS) plus specific source for Taiwan and Hong Kong	14 Asian countries. Subsamples for low-income and medium-income countries	1 year pooling over 18 yrs 1965-82 Differentiated pre- and post-1973	Per capita GDP for savings estimation +	Change in exports as % of GDP +	Labor force growth n.s. Saving rate itself estimated DLS + External aid as % of GDP + or n.s. Private foreign investment (as % of GDP) +		0.13 < R-sqr < 0.37 and indirect least squares
SINGH (1983)	Impact of foreign aid and/or of govt. intervention	GDP (World Bank)	73 DCs (incl. 37 African)	11 years 1960-70 1970-80 Homogeneity of the 2 periods tested and rejected (pooling test rejected)	Per capita income + Population + Regional silent n.s. Oil silent n.s.	Foreign aid + Government intervention (in a second model) - but to detriment of others	Saving rate +		R-sqr = 0.52 (1960-70) (1970-80) The variable "government intervention" confiscates all! But it can replace foreign aid

ANALYTICAL SUMMARY OF THIRTY RECENT STUDIES

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VENIERIS and GUPTA (1983)	Impact of sociopolitical instability (simultaneous equations)	Per capita GNP (United Nations)	104	1 year: 1957			Investment share + Population growth -	Socio-political instability -	R-sqr = 0.25 Double least squares
WHEELER (1984)	Study reasons for Africa's poor growth performances, distinguishing between fundamental or environmental variables and economic policy variables	GDP (World Bank)	25 Sub-Saharan African countries	10 years Av. growth rate 1970-80	Silent variable equal to 1 if av. annual terms of trade growth rate exceeds 1.5% + Silent variable equal to 1 if total absence of mining exports in 1970 + Export diversifcn. indicators + Numerous other non-signif. variables (rainfall, external aid, emigrant workers' remittances, export price instability)	Av. annual rate of growth of real effective exchange rate calculated by IMF - Indicator of weight of customary practices in foreign-exch. allocation for capital goods and non-food consumer goods imports - Difference of marginal import propensities in period of rising and falling export receipts (measure of incapacity to ensure trade balance equilibrium) -		Silent variable equal to 1 if country has had less than 4 stable years (no coup d'etat or armed violence) out of 11 (measure of political instability)	

Table 2

AVERAGE ANNUAL GROWTH RATES (GDP/GNP AND WORLD BANK/IMF COMPARISON)

	GDP Growth Rate 1970-81					GDP Growth Rate 1974-81				
	GDP WB	GNP WB	GDP IFS	GDPWB - GNP	GDPWB - GDPIFS	GDP WB	GNP WB	GDP IFS	GDPWB - GNPWB	GDPWB - GDPIFS
Benin	3.40	3.94	-	-0.54	-	4.67	4.89	-	-0.22	-
Cameroon	6.30	6.31	-	-0.01	-	7.82	8.04	-	-0.22	-
Central Afr. Rep.	1.57	1.70	-	-0.13	-	0.37	0.53	-	-0.16	-
Congo	5.52	4.65	-	0.87	-	5.33	4.04	-	1.29	-
Cote d'Ivoire	6.16	6.44	-	-0.28	-	6.21	6.32	-	-0.11	-
Gabon	4.21	2.93	-	1.28	-	-5.24	-7.32	-	2.08	-
Burkino Faso	3.60	3.69	-	-0.09	-	3.30	3.90	-	-0.60	-
Mali	4.60	4.78	-	-0.18	-	5.33	5.69	-	-0.36	-
Niger	3.13	2.99	-	0.14	-	6.74	6.97	-	-0.23	-
Senegal	1.97	1.76	-	0.21	-	1.08	0.66	-	0.42	-
Chad	-2.55	-2.64	-	0.09	-	-6.03	-6.04	-	0.01	-
Togo	3.20	3.18	2.68	0.02	0.52	2.66	2.40	3.65	0.26	-0.99
Angola	-5.66	-5.66	-	0.00	-	-3.32	-3.32	-	0.00	-
Botswana	12.57	12.59	13.92	-0.02	-1.35	9.09	8.20	10.64	0.89	-1.55
Burundi	3.51	3.78	3.68	-0.27	-0.17	4.79	5.04	4.82	-0.25	-0.03
Ethiopia	2.59	2.66	2.27	-0.07	0.32	2.65	2.74	2.45	-0.09	0.20
Gambia	4.48	4.70	-	-0.22	-	1.57	1.17	-	0.40	-
Ghana	-0.25	-0.24	0.42	-0.01	-0.67	-0.42	-0.57	-0.43	0.15	0.01
Guinea	3.08	2.99	-	0.09	-	2.25	2.02	-	0.23	-
Guinea-Bissau	3.08	2.65	-	0.43	-	2.68	2.73	-	-0.05	-
Kenya	6.21	6.27	5.53	-0.06	0.68	5.27	5.51	5.36	-0.24	-0.09
Lesotho	8.58	10.44	-	-1.86	-	7.65	7.09	-	0.56	-
Liberia	1.65	3.06	-0.29	-1.41	1.94	1.41	3.10	-0.52	-1.69	1.93
Madagascar	0.35	0.60	-	-0.25	-	0.55	0.49	-	0.06	-
Malawi	5.58	5.37	4.49	0.21	1.09	5.11	4.42	3.74	0.69	1.37
Mauritius	6.02	5.83	6.47	0.19	-0.45	4.16	3.90	4.78	0.26	-0.62
Mauritania	1.63	1.83	-	-0.20	-	1.41	1.42	-	-0.01	-
Mozambique	-2.06	-2.06	-	0.00	-	-1.08	-1.08	-	0.00	-
Nigeria	4.46	4.83	3.55	-0.37	0.91	1.92	2.04	1.78	-0.12	0.14
Uganda	-1.69	-1.61	-1.66	-0.08	-0.03	-2.99	-2.92	-3.08	-0.07	0.09
Rwanda	5.30	5.28	-	0.02	-	5.52	5.70	-	-0.18	-
Sierra Leone	1.77	1.58	2.04	0.19	-0.27	1.71	1.46	2.35	0.25	-0.64
Somalia	3.87	3.90	-	-0.03	-	6.14	6.15	-	-0.01	-
Sudan	6.15	6.10	-	0.05	-	6.47	6.45	-	0.02	-
Swaziland	6.09	6.67	-	-0.58	-	5.60	5.72	-	-0.12	-
Tanzania	4.23	4.24	5.47	-0.01	-1.24	3.60	3.64	4.91	-0.04	-1.31
Zaire	-0.23	0.05	-0.22	-0.28	-0.01	-1.51	-1.30	-1.48	-0.21	-0.03
Zambia	0.39	0.39	1.21	0.00	-0.82	-1.56	-1.54	0.09	-0.02	-1.65
Zimbabwe	1.76	1.83	2.05	-0.07	-0.29	-0.21	-0.11	1.40	-0.10	-1.61
Afghanistan	-	-	-	-	-	-	-	-	-	-
Algeria	6.90	6.38	-	0.52	-	7.28	6.46	-	0.82	-
Argentina	1.94	1.82	2.01	0.12	-0.07	1.13	0.81	1.30	0.32	-0.17
Bangladesh	4.12	4.20	-	-0.08	-	5.46	5.66	5.02	-0.20	0.44
Bhutan	-	2.06	-	-	-	-	2.04	-	-	-
Burma	4.83	4.77	4.57	0.06	0.26	6.11	6.06	6.11	0.05	0.00

Table 2

AVERAGE ANNUAL GROWTH RATES (GDP/GNP AND WORLD BANK/IMF COMPARISON)

	GDP Growth Rate 1970-81					GDP Growth Rate 1974-81				
	GDP WB	GNP WB	GDP IFS	GDPWB - GNP	GDPWB - GDPIFS	GDP WB	GNP WB	GDP IFS	GDPWB - GNPWB	GDPWB - GDPIFS
Bolivia	4.36	4.03	4.16	0.33	0.20	3.00	2.32	2.63	0.68	0.37
Brazil	7.72	7.45	7.76	0.27	-0.04	5.71	5.32	5.84	0.39	-0.13
Chile	2.07	1.81	2.09	0.26	-0.02	5.57	5.35	5.62	0.22	-0.05
China	-	-	-	-	-	-	-	-	-	-
Cyprus	5.82	5.86	2.56	-0.04	3.26	8.17	7.96	7.33	0.21	0.84
Colombia	5.61	5.78	5.24	-0.17	0.37	5.25	5.36	4.94	-0.11	0.31
Costa Rica	5.22	4.78	5.32	0.44	-0.10	4.29	3.59	4.50	0.70	-0.21
Cuba	-	-	-	-	-	-	-	-	-	-
Egypt	7.54	8.21	-	-0.67	-	9.95	10.15	-	-0.20	-
El Salvador	3.18	3.21	3.20	-0.03	-0.02	0.89	0.91	0.92	-0.02	-0.03
Ecuador	8.58	8.23	8.59	0.35	-0.01	6.15	5.63	6.17	0.50	-0.02
Fiji	4.54	4.86	-	-0.32	-	3.87	3.81	-	0.06	-
Guatemala	5.49	5.67	5.48	-0.18	0.01	4.99	5.13	4.97	-0.14	0.02
Guyana	1.50	1.71	1.93	-0.21	-0.43	0.12	-0.29	0.56	0.41	-0.44
Haiti	3.36	3.37	4.29	-0.01	-0.93	3.43	3.38	4.41	0.05	-0.98
Honduras	4.39	4.13	13.92	0.26	-9.53	5.86	5.24	12.15	0.62	-6.29
Hong Kong	9.96	9.96	-	0.00	-	11.45	11.45	-	0.00	-
India	3.63	3.73	3.67	-0.10	-0.04	4.15	4.22	4.21	-0.07	-0.06
Indonesia	7.82	7.33	7.85	0.49	-0.03	7.61	7.29	7.64	0.32	-0.03
Iran	-	-	2.66	-	-	-	-	-3.26	-	-
Iraq	-	-	-	-	-	-	-	-	-	-
Jamaica	-1.15	-1.30	-1.25	0.15	0.10	-2.17	-3.19	-2.24	1.02	0.07
Jordan	-	-	7.56	-	-	10.53	11.27	12.03	-0.74	-1.50
Libya	-	-	-	-	-	-	-	-	-	-
Macao	-	-	-	-	-	-	-	-	-	-
Malaysia	7.80	7.72	14.44	0.08	-6.64	7.68	7.71	19.12	-0.03	-11.44
Morocco	5.24	5.47	5.45	-0.23	-0.21	4.90	4.57	4.32	0.33	0.58
Mexico	6.53	6.38	6.53	0.15	0.00	6.72	6.49	6.72	0.23	0.00
Mongolia	-	-	-	-	-	-	-	-	-	-
Nepal	2.12	2.15	2.71	-0.03	-0.59	1.60	1.64	2.83	-0.04	-1.23
Nicaragua	0.79	0.72	1.15	0.07	-0.36	-3.11	-3.26	-3.04	0.15	-0.07
Pakistan	4.95	5.26	5.04	-0.31	-0.09	5.70	6.13	5.92	-0.43	-0.22
Panama	4.55	4.55	4.69	0.00	-0.14	5.35	5.17	5.65	0.18	-0.30
Papua New Guinea	2.07	2.07	3.28	0.00	-1.21	1.26	1.27	1.04	-0.01	0.22
Paraguay	8.80	8.90	8.80	-0.10	0.00	10.10	10.14	10.11	-0.04	-0.01
Peru	3.08	2.82	3.13	0.26	-0.05	2.15	1.68	1.70	0.47	0.45
Philippines	6.23	6.37	-	-0.14	-	6.12	6.04	-	0.08	-
Puerto Rico	-	-	-	-	-	-	-	-	-	-
Korea	9.02	8.68	8.71	0.34	0.31	7.83	7.38	7.84	0.45	-0.01
Dominican Rep.	6.30	6.08	6.33	0.22	-0.03	4.63	4.38	4.69	0.25	-0.06
Singapore	8.55	8.31	8.55	0.24	0.00	8.43	8.31	8.44	0.12	-0.01
Sri Lanka	4.68	4.72	4.92	-0.04	-0.24	5.95	5.90	5.48	0.05	0.47
Syria	9.43	9.35	9.26	0.08	0.17	6.72	6.59	6.89	0.13	-0.17
Taiwan	-	-	-	-	-	-	-	-	-	-
Thailand	7.22	6.84	7.20	0.38	0.02	7.52	6.83	7.46	0.69	0.06
Trinidad and Tobago	5.05	5.40	4.56	-0.35	0.49	6.78	8.23	5.08	-1.45	1.70
Tunisia	7.40	7.59	6.38	-0.19	1.02	6.60	6.86	6.03	-0.26	0.57
Turkey	5.19	5.01	-	0.18	-	3.34	3.11	-	0.23	-
Uruguay	3.13	3.14	3.28	-0.01	-0.15	4.06	4.19	4.37	-0.13	-0.31
Venezuela	4.54	5.19	4.41	-0.65	0.13	3.47	3.81	3.23	-0.34	0.24
Yemen	8.80	8.69	8.82	0.11	-0.02	7.40	6.99	7.44	0.41	-0.04
Yugoslavia	5.82	5.71	5.56	0.11	0.26	5.20	4.96	5.27	0.24	-0.07

Table 3

ILLUSTRATIVE MODEL: COMPARISON OF THE DIFFERENT REGRESSIONS

	Number of countries	Constant	y	N	P/P	G/Y	X/Y	R^2	F	RSS
1. GDP/GNP Comparison (source: World Bank)										
Growth rate 1970-81	69									
(1) GDP		1,968	0,422	0,373	-0,034	-0,012	0,5	0,34	6,538	307,904
			(1,133)	(1,837)**	(2,712)**	(0,378)	(4,485)**			
(2) GNP		2,390	0,350	0,335	-0,036	-0,004	0,4	0,30	5,473	328,658
			(0,909)	(1,594)*	(2,733)**	(0,130)	(4,04)**			
2. World Bank/IMF GDP Comparison										
Growth rate 1970-81	49									
(3) World Bank World Tables 1984		1,766	0,558	0,387	-0,036	-0,039	0,4	0,39	5,601	236,553
			(1,181)	(1,394)*	(2,601)**	(0,866)	(3,821)**			
(4) IMF IFS		0,577	0,424	0,238	-0,038	-0,05	0,5	0,33	4,290	375,846
			(0,712)	(2,205)**	(0,680)	(0,88)	(3,448)**			

	Number of countries	Constant	v	N	P/P	G/Y	X/Y	R^2	F	RSS
3. Regressions comparison, by base	40									
(5) Calculation base 1970		1,78	0,678	0,023	-0,036	0,052	1,0	0,55	8,22	146,44
			(1,508)*	(0,078)	(2,208)**	(1,023)	(5,458)**			
(6) Calculation base 1971		1,89	0,646	0,018	-0,036	-0,048	1,0	0,54	8,14	144,74
			(1,445)*	(0,064)	(2,231)**	(0,955)	(5,45)**			
(7) Calculation base 1972		1,58	0,671	0,020	-0,037	-0,043	1,0	0,55	8,38	139,72
			(1,529)*	(0,072)	(2,278)**	(0,862)	(5,568)**			
(8) Calculation base 1973		0,69	0,808	0,195	-0,039	-0,048	1,0	0,56	8,57	141,07
			(1,832)**	(0,684)	(2,413)**	(0,958)	(5,549)			
(9) Calculation base 1974		1,38	0,682	0,196	-0,036	-0,058	1,0	0,60	10,04	126,90
			(1.629)*	(0,723)	((2,36)**	(1,222)	(6,026)**			
(10) Calculation base 1975		1,05	0,719	0,21	-0,037	-0,052)	1,0	0,61	10,56	121,70
			(1,756)**	(0,789)	(2,473)**	(1,123)	(6,227)**			
(11) Calculation base 1976		1,11	0,720	0,193	-0,038	-0,054	1,0	0,61	10,48	121,82
			(1,756)**	(0,728)	(2,522)**	(1,163)	(6,161)**			
(12) Calculation base 1977		1,06	0,729	0,114	-0,037	-0,057	1,0	0,61	10,44	123,00
			(1,769)**	(0,729)	(2,466)**	(1,228)	(6,130)**			
(13) Calculation base 1978		0,60	0,796	0,220	-0,038	-0,057	1,0	0,59	9,74	129,62
			(1,886)**	(0,803)	(2,471)**	(1,187)	(5,868)**			
(14) Calculation base 1979		0,96	0,748	0,186	-0,038	-0,061	1,1	0,60	10,36	136,49
			(1,724)**	(0,661)	(2,366)**	(1,244)	(6,135)**			
(15) Calculation base 1980		1,53	0,685	0,133	-0,038	-0,064	1,1	0,62	11,23	136,82
			(1,572)**	(0,474)	(2,363)**	(1,315)*	(6,426)**			
(16) Calculation base 1981		0,72	0,810	0,187	-0,041	-0,062	1,1	0,62	11,14	139,53
			(1,845)**	(0,658)	(2,537)**	(1,251)	(6,347)			
(17) World Tables data		0,85	0,804	0,155	-0,041	-0,051	1,0	0,58	9,44	129,42
			(1,902)**	(0,566)	(2,665)**	(1,072)	(5,738)**			

	Number of countries	Constant	y	N	P/Y	G/Y	X/Y	R^2	F	RSS
4. Regressions comparison, for various samples										
GDP growth rate (1970-81) source World Bank										
(a) By geographic areas Cf. total sample (equation 1)	69									
(18) Total sample minus Latin America	47	3,023	0,174 (0,299)	0,338 (1,402)*	-0,077 (1,705)**	0,027 (0,604)	0,4 (3,325)**	0,35	4,498	215,431
(19) Latin America alone	22	-0,855	1,114 (1,318)	0,448 (1,067)	-0,034 -2,228)**	-0,097 (1,438)*	0,5 (1,409)*	0,50	3,258	64,066
(20) Asia alone	14	-12,204	1,985 (1,687)*	0,848 (1,729)*	0,209 (1,336)	0,096 (1,036)	0,1 (0,738)	0,53	1,833(1)	31,018
(21) Africa alone	28	5,580	-0,34 (0,465)	0,132 (0,354)	-0,042 (0,963)	-0,013 (0,246)	1,3 (5,243)**	0,64	8,014	75,779

	Number of countries	Constant	y	N	P/P	G/Y	X/Y	R^2	F	RSS
(b) Elimination of outliers or aberrant countries Cf. total sample (eq. 1)	69									
(22) Total sample minus the country with the largest residual in equation 1 (without Botswana)	68	0,937	0,611 (1,707)**	0,,464 (2,385)**	-0,037 (3,07)**	-0,019 (0,614)	0,4 (3,52)**	0,33	6,165	219,977
(23) Total sample minus the two countries with the largest residuals in equation 1 (without Syria and Botswana)	67	1,826	0,534 (1,557)*	0,404 (2,160)**	-0,034 (2,964)*	-0,04 (1,295)*	0,4 (3,783)**	0,36	6,961	190,509
(24) Total sample minus the three countries with the largest residuals in equation 1 (without Jamaica, Syria and Botswana)	66	1,084	0,65 (1,955)**	0,395 (2,199)**	-0,036 (3,216)**	-0,03 (1,000)	0,4 (3,695)**	0,37	7,011	246,869
(25) Total sample minus the 4 countries with the largest residuals in equation 1 (without Lesotho, Jamaica, Syria and Botswana)	65	0,084	0,820 (2,586)**	0,473 (2,774)**	-0,037 (3,598)**	-0,337 (1,311)*	0,3 (3,790)**	0,43	8,790	270,422
(26) Total sample minus Singapore	68	0,374	0,623 (1,833)**	0,416 (2,265)**	-0,038 (3,354)**	-0,007 (0,243)	0,9 (5,172)**	0,45	10,337	242,638

	Number of countries	Constant	y	N	P/P	G/Y	X/Y	R^2	F	RSS
5. Regressions comparison by period. GDP growth rate. Source World Bank 1970-81: cf. eq. 1	69									
(27) 1974-81	69	2,663	0,216	0,473	-0,032	-0,016	0,4	0,32	5,942	378,01
			(0,549)	(2,089)**	(2,461)**	(0,467)	(4,021)**			
6. Cross-sectional analysis/ pooling comparison										
(28) Cross-sectional regression: average GDP growth rate (1974-81). Source: World Bank	40	3,623	0,110	0,456	-0,026	-0,034	0,4	0,40	4,600	190,37
			(0,210)	(1,634)*	(1,029)	(0,639)	(3,478)**			
(29) Pooling regression: annual GDP growth rate (1975-81). Source: World Bank (280 observations)	40	2,729	0,192	0,547	-0,043	-0,016	0,473	0,27	20,790	5345,35
			(0,599)	(2,907)**	(4,685)**	(0,470)	(7,827)**			

Meaning and source of the independent variables:

y: Per capita GNP in US$ in initial year) Source:
N: Number of inhabitants in initial year) World Bank
Y: Gross domestic product in national currency) World Tables, 1984
P: Consumer price index (source: IMF, IFS)
G: Total public expenditure of central government (source: IFM, Government Finance Statistics Yearbook - 1986

Between parentheses student T:
**: Significant at 5%
*: Significant at 10%.

Table 4

AVERAGE ANNUAL GDP GROWTH RATES
(SENSITIVITY TO PARTIAL REBASING)

GDP GROWTH RATE WITH DIFFERENT BASE YEARS

	WB*	70	71	72	73	74	75	76	77	78	79	80	81	MIN	MAX	DIF	MEAN	S
Benin	3.31	-	-	3.77	3.77	3.82	5.03	4.96	5.01	4.86	4.90	4.98	4.94	3.77	5.03	1.26	4.60	0.57
Cameroon	6.30	6.32	6.34	6.31	6.29	6.28	6.32	6.33	6.44	6.57	6.34	6.37	6.28	6.28	6.57	0.29	6.35	0.08
Central African Rep.	1.57	-	-	-	-	1.69	1.65	1.61	1.67	1.67	-	-	-	1.61	1.69	0.08	1.66	0.03
Congo	5.52	4.80	4.57	4.70	4.80	4.88	5.33	5.62	5.30	5.36	5.68	6.76	7.48	4.57	7.48	2.91	5.44	0.88
Cote d'Ivoire	6.16	6.76	6.90	6.83	6.65	6.43	6.56	6.38	6.16	6.30	6.16	6.19	6.21	6.16	6.90	0.74	6.46	0.27
Gabon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burkina Faso	3.55	3.55	3.55	3.43	3.45	3.42	3.49	3.33	3.33	3.27	3.29	3.29	3.30	3.27	3.55	0.28	3.39	0.10
Mali	4.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Niger	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Senegal	1.97	1.72	1.76	1.79	1.77	1.86	2.03	2.05	1.87	1.62	1.97	2.27	2.26	1.62	2.27	0.65	1.91	0.21
Chad	-2.55	-2.76	-2.72	-2.79	-2.74	-2.58	-2.42	-2.54	-2.55	-2.55	-0.38	-0.17	-0.20	-2.79	-0.17	2.62	-2.03	1.08
Togo	3.20	-	-	-	-	-	-	3.20	4.33	3.43	2.83	4.13	4.07	2.83	4.33	1.50	3.66	0.60
Angola	-7.28	-7.28	-7.43	-7.48	-6.97	-5.93	-6.32	-6.98	-7.09	-7.23	-7.17	-6.57	-6.53	-7.48	-5.93	1.55	-6.91	0.48
Botswana	12.57	12.82	12.92	12.88	12.90	12.40	12.42	12.30	12.40	12.08	12.88	13.09	12.52	12.08	13.09	1.01	12.63	0.32
Burundi	3.19	-	-	-	-	-	-	-	-	-	-	-	4.15	4.15	4.15	0.00	4.15	-
Ethiopia	2.16	2.16	2.15	2.21	2.18	2.14	2.19	2.13	2.05	1.99	2.00	2.00	2.01	1.99	2.21	0.22	2.10	0.08
Gambia	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ghana	-0.25	0.26	0.19	0.08	-0.03	-0.10	-0.25	-0.34	-0.24	-0.37	-0.47	-0.44	-1.07	-1.07	0.26	1.33	-0.23	0.36
Guinea	3.31	-	-	-	2.92	3.11	3.41	3.63	3.64	3.63	3.64	-	-	2.92	3.64	0.72	3.43	0.30
Guinea-Bissau	3.08	4.04	3.97	3.99	4.07	4.10	-	-	-	-	-	-	-	3.97	4.10	0.13	4.03	0.05
Kenya	5.76	6.21	6.23	5.84	5.80	5.74	5.76	5.67	5.58	5.67	5.69	5.71	5.73	5.58	6.23	0.65	5.80	0.21
Lesotho	7.84	2.43	2.57	3.28	3.80	3.70	3.18	3.79	3.95	4.50	4.71	7.64	-	2.43	7.64	5.21	3.96	1.41
Liberia	1.28	1.14	1.21	1.14	1.37	1.38	0.81	1.04	1.05	1.33	1.58	1.68	-	0.81	1.68	0.87	1.25	0.25
Madagascar	0.35	-	0.35	0.35	0.34	0.30	0.30	0.28	0.25	0.25	0.22	0.22	0.29	0.22	0.35	0.13	0.29	0.05
Malawi	6.23	6.26	6.27	6.26	6.26	6.26	6.26	6.32	6.26	6.26	6.26	-	-	6.26	6.32	0.06	6.27	0.02
Mauritius	6.20	7.05	7.01	6.96	6.71	5.14	5.27	5.18	5.27	5.42	5.31	5.62	5.59	5.14	7.05	1.91	5.88	0.80
Mauritania	1.72	-	-	-	5.97	5.82	5.28	5.38	6.15	6.24	6.97	5.89	6.14	5.28	6.97	1.69	5.98	0.50
Mozambique	-2.12	-2.12	-2.11	-2.10	-2.17	-2.09	-2.18	-2.21	-2.25	-2.27	-2.28	-2.27	-2.27	-2.28	-2.09	0.19	-2.19	0.07
Nigeria	4.54	1.11	1.02	0.93	8.09	7.00	7.28	7.19	7.03	6.92	6.82	6.75	6.70	0.93	8.09	7.16	5.57	2.77
Uganda	-1.57	-3.02	-2.75	-2.97	-3.02	-2.87	-2.34	-2.21	-	-	-	-	-	-3.02	-2.21	0.81	-2.74	0.33
Rwanda	5.87	-	-	5.76	5.69	5.70	6.19	6.28	6.34	6.34	6.29	6.31	6.31	5.69	6.34	0.65	6.12	0.28
Sierra Leone	1.87	2.02	2.14	2.11	1.87	1.52	1.82	2.06	1.78	1.00	0.42	0.79	0.85	0.42	2.14	1.72	1.53	0.60
Somalia	3.39	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-
Sudan	6.56	5.94	5.94	5.94	6.55	6.55	6.55	6.55	6.54	6.54	6.52	6.56	6.55	5.94	6.56	0.62	6.39	0.27
Swaziland	4.49	1.48	1.48	-	-	-	-	-	-	-	-	-	-	1.48	1.48	0.00	1.48	0.00
Tanzania	3.96	3.90	3.91	3.82	3.73	3.69	3.63	3.55	3.43	3.42	3.39	3.34	3.31	3.31	3.91	0.60	3.59	0.22
Zaire	-0.23	-0.23	-0.11	0.06	-0.24	-0.38	-0.52	-0.85	-1.03	-1.04	-1.36	-1.68	-1.84	-1.84	0.06	1.90	-0.77	0.63
Zambia	0.39	0.41	0.62	0.61	0.37	0.25	0.62	0.57	0.70	0.61	0.31	0.27	0.33	0.25	0.70	0.45	0.47	0.16
Zimbabwe	1.60	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.55	-	-	1.55	1.61	0.06	1.60	0.02
Afghanistan	3.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Algeria	6.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Argentina	1.94	1.94	1.95	1.93	2.03	2.04	1.96	1.86	1.95	1.95	1.98	2.03	-	1.86	2.04	0.48	1.96	0.05
Bangladesh	4.12	4.64	4.61	4.12	4.12	3.96	3.65	3.76	3.75	3.70	3.65	3.56	3.70	3.56	4.64	1.08	3.93	0.37
Bhutan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burma	4.83	4.82	4.83	4.82	4.80	4.62	4.54	4.53	4.54	4.55	4.54	4.54	4.55	4.53	4.83	0.30	4.64	0.13
Bolivia	4.36	4.36	4.43	4.30	4.21	3.97	4.12	4.19	4.18	-	4.02	4.02	4.16	3.97	4.43	0.48	4.18	0.15
Brazil	8.35	8.63	-	-	-	-	-	-	-	-	-	-	-	8.63	8.63	0.00	8.63	-
Chile	2.07	2.46	2.41	2.43	2.44	2.33	2.48	2.39	2.38	2.34	2.40	2.38	2.33	2.33	2.48	0.15	2.40	0.05
China	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyprus	5.52	5.61	5.73	5.82	5.51	5.65	5.70	5.59	5.65	5.79	5.87	5.97	5.98	5.51	5.98	0.47	5.74	0.15

Table 4

AVERAGE ANNUAL GDP GROWTH RATES
(SENSITIVITY TO PARTIAL REBASING)

GDP GROWTH RATE WITH DIFFERENT BASE YEARS

	WB**	70	71	72	73	74	75	76	77	78	79	80	81	MIN	MAX	DIF	MEAN	S
Colombia	5.68	-	-	-	-	-	-	-	-	-	-	-	5.42	5.42	5.42	0.00	5.42	-
Costa Rica	5.22	5.26	5.30	5.31	5.28	5.21	5.17	5.14	5.00	5.04	5.03	5.05	4.94	4.94	5.31	0.37	5.14	0.13
Cuba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Egypt	8.10	8.75	8.70	8.64	8.48	-	-	-	7.78	7.92	8.04	7.87	-	7.78	8.75	0.97	8.27	0.41
El Salvador	3.13	3.12	3.11	3.09	3.09	3.09	3.09	3.06	3.06	3.10	3.06	3.07	3.04	3.04	3.12	0.08	3.08	0.02
Ecuador	8.58	8.22	8.21	8.08	8.26	8.86	8.58	8.39	8.41	8.16	8.69	9.11	8.93	8.08	9.11	1.03	8.49	0.34
Fiji	4.63	5.03	4.91	4.81	4.65	4.58	4.50	4.44	4.63	-	-	-	-	4.44	5.03	0.59	4.69	0.20
Guatemala	5.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Guyana	1.59	1.93	1.98	1.98	2.22	1.93	1.79	1.69	1.59	1.49	1.41	1.24	1.38	1.24	2.22	0.98	1.72	0.30
Haiti	3.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Honduras	4.37	4.45	4.47	4.46	4.44	4.42	4.41	4.38	4.28	4.34	4.41	4.44	4.47	4.28	4.47	0.19	4.41	0.06
Hong Kong	10.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
India	3.68	3.68	3.68	3.60	3.52	3.62	3.78	3.72	3.72	3.73	3.69	3.70	3.71	3.52	3.78	0.26	3.68	0.07
Indonesia	7.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iran	7.36	11.57	11.09	11.09	9.64	7.36	7.48	7.57	7.94	-	-	-	-	7.36	11.57	4.21	9.22	1.83
Iraq	10.45	10.32	10.19	10.10	9.97	9.44	9.83	9.75	-	-	-	-	-	9.44	10.32	0.88	9.94	0.30
Jamaica	-1.15	-1.13	-1.02	-0.92	-1.09	-1.15	-1.09	-1.06	-1.13	-1.38	-1.57	-1.74	-1.91	-1.91	-0.92	0.99	-1.27	0.31
Jordan	6.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Libya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Macao	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malaysia	7.80	7.80	7.84	7.86	7.84	7.69	7.71	7.73	7.69	7.68	7.69	7.68	-	7.68	7.86	0.18	7.75	0.07
Morocco	5.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mexico	6.53	6.53	6.52	6.52	6.47	6.49	6.50	6.50	6.56	6.55	6.56	6.64	6.60	6.47	6.64	0.17	6.54	0.05
Mongolia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nepal	2.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nicaragua	0.79	1.33	1.34	1.29	1.19	1.14	1.15	1.11	0.98	0.90	0.82	0.79	0.86	0.79	1.34	0.55	1.07	0.20
Pakistan	4.85	4.85	4.85	4.86	4.80	4.75	4.72	4.78	4.73	4.73	4.68	4.71	4.72	4.68	4.86	0.18	4.76	0.06
Panama	4.55	4.77	4.79	4.76	4.71	4.52	4.48	4.61	4.60	4.64	4.62	4.62	-	4.48	4.79	0.31	4.65	0.10
Papua New Guinea	2.07	-	-	-	-	-	-	-	-	-	-	3.26	3.26	3.26	3.26	-	3.26	0.00
Paraguay	8.80	9.13	9.03	8.92	8.82	8.90	8.91	8.93	8.80	8.81	8.80	8.85	8.87	8.80	9.13	0.33	8.90	0.10
Peru	3.08	3.15	3.15	3.13	3.13	3.10	3.04	3.08	3.08	3.08	3.18	3.12	3.13	3.04	3.18	0.14	3.11	0.04
Philippines	6.23	6.26	6.23	6.23	6.20	6.26	6.22	6.20	6.23	6.20	6.23	6.29	6.30	6.20	6.30	0.10	6.24	0.03
Puerto Rico	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Korea	9.02	9.69	9.43	9.36	9.30	9.16	9.02	8.88	8.66	8.38	8.42	8.47	8.53	8.38	9.69	1.31	8.94	0.45
Dominican Rep.	6.30	6.30	6.31	6.30	6.19	6.06	6.04	6.14	6.09	6.17	6.19	6.18	-	6.04	6.31	0.27	6.18	0.09
Singapore	8.5?	8.48	8.39	8.40	-	8.46	8.46	9.56	9.55	9.55	9.49	9.41	9.37	8.39	9.56	1.17	9.01	0.55
Sri Lanka	4.29	4.29	4.32	4.33	4.16	3.96	3.92	3.94	3.80	3.89	3.95	3.95	3.98	3.80	4.33	0.53	4.04	0.18
Syria	10.01	10.35	10.16	10.28	10.15	9.94	9.99	10.05	10.02	10.02	9.86	10.87	-	9.86	10.35	0.49	10.08	0.14
Taiwan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thailand	7.22	7.34	7.36	7.22	7.09	7.15	7.17	7.16	7.13	7.15	7.12	7.12	7.19	7.09	7.36	0.27	7.18	0.08
Trinidad and Tobago	5.54	5.54	5.51	5.52	5.32	4.68	4.54	4.63	4.55	4.74	4.54	4.25	4.34	4.25	5.54	1.29	4.85	0.48
Tunisia	7.26	7.33	7.27	7.26	7.22	7.09	7.12	7.16	7.16	7.23	7.17	6.93	6.83	6.83	7.33	0.50	7.15	0.14
Turkey	5.37	5.39	5.36	5.39	5.31	5.31	5.30	5.28	5.28	5.28	5.34	5.39	5.44	5.28	5.44	0.16	5.34	0.05
Uruguay	3.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Venezuela	4.54	4.66	4.50	4.43	4.04	2.50	2.60	2.63	2.62	2.95	2.56	2.01	2.00	2.00	4.66	2.66	3.12	0.99
Yemen	8.80	8.46	8.78	9.03	9.27	9.20	9.29	9.30	9.30	9.31	9.32	9.57	9.86	8.46	9.86	1.40	9.24	0.36
Yugoslavia	5.68	4.90	4.95	4.89	4.95	4.95	5.20	4.93	4.95	4.94	4.74	4.75	6.56	4.74	6.56	1.82	5.06	0.49

** Growth rates correspond to old World Bank series with different base years according to countries.

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